

FAA ADS - 3

AP 6003387



TECHNICAL REPORT

ADS - 3

FLAMMABILITY AND SMOKE CHARACTERISTICS
OF AIRCRAFT INTERIOR MATERIALS

John F. Marcy E. B. Nicholas J. E. Demaree
Systems Research and Development Service

FEDERAL AVIATION AGENCY

Washington, D.C.

January 1964

TABLE OF CONTENTS

	Page
SUMMARY	ii
INTRODUCTION	1
BACKGROUND	1
DISCUSSION	3
Fire Testing	3
Equipment Description	5
Laboratory Tests and Measurements	6
Test Results and Analysis	11
CONCLUSIONS	20
REFERENCES	21
ACKNOWLEDGMENTS	23
SUMMARY TABLES	24
ILLUSTRATIONS	30
APPENDIX 1	

 Materials Description (11 pages)

APPENDIX 2

 Flammability Test Data on Interior Materials (59 pages)

FLAMMABILITY AND SMOKE
CHARACTERISTICS OF AIRCRAFT
INTERIOR MATERIALS

TECHNICAL REPORT
ADS - 3

111

by

John F. Marcy
E. B. Nicholas
J. E. Demaree

Systems Research and Development Service

January 1964

This report was prepared by the SRDS under
Project No. 311-3X1 for the Aircraft
Development Service.

i-B

SUMMARY

Flammability and smoke characteristics of interior materials were determined from a selection of 109 materials representative of present usage in the aviation industry. A comparison was made of the flame-resistant characteristics exhibited by the different materials on the basis of: (1) test method, (2) thickness, weight, composition and backing, (3) fire-retardant treatment, and (4) degradation from use and cleaning. By employing test methods defined in FAA Flight Standards Service Release 453 and Federal Specification CCC-T-191b, burning characteristics were obtained in terms of burn rate, burn length, and self-extinguishing time. A Flame-Spread Index and smoke factor also were obtained by making use of the Radiant Panel Test Apparatus.

INTRODUCTION

This project was designed to provide technical information from standard laboratory fire tests that could be used as a basis for defining more acceptable flame-resistant standards and test methods for aircraft interior materials than those now provided by FAA Flight Standards Service (FSS) Release No. 453.

Recent fire experience in air transport passenger compartments and the development of new materials and test methods had suggested that the present standards were perhaps no longer adequate. As part of the project assignment, a laboratory test program was established using the test equipment and facilities at the National Bureau of Standards, Washington, D. C. Under this test program, some 100 different materials representative of materials in current use in commercial air transport were tested for relative flammability by various test methods including that specified in FSS Release No. 453, for direct comparison. Future work on the project will include toxic gas analyses on the combustion by-products of materials and also full-scale cabin fire tests using interiors with different degrees of fire resistance. The result of these tests will be covered in separate reports.

BACKGROUND

The events that preceded this project and were responsible for it being conducted were foremost: (1) concern with recent fire experience involving interior materials in air transport passenger cabins, (2) increased use of plastics and synthetics in interior furnishings, and (3) development of new laboratory test methods and criteria for evaluating flame-resistant characteristics of materials.

An acceptable procedure for showing compliance with the pertinent flame-resistant requirements in CAR's 3, 4b, 6, and 7 is contained in FSS Release 453, dated November 9, 1961. This document is based almost entirely on an earlier Safety Regulation Release 259, dated August 26, 1947. The two documents establish both a test method and a burn-rate limit of 4 inches per minute for showing compliance. However, a burn rate of this magnitude is now generally considered very lenient. A survey of interior materials in aircraft reveals that these are essentially the same as those offered to and used by industry in general; the most notable exception among the aircraft materials being the vinyl-coated fiberglass fabrics. Other exceptions are the synthetic fiber fabrics and

v vinyl sheets which are sometimes specially flame-retardant treated. In any case, the degree of flame resistance required by present regulations does not encourage the development or use of better materials at this time. During the last few years, however, as a result of a series of fire in which the interior cabins of several large transport aircraft were severely damaged (Reference 1), the aviation industry has shown an increasing interest in the problem of minimizing the hazard from cabin fires (References 2 and 3). At least one major aircraft company has undertaken an extensive testing program with the object of selecting the best flame-retardant materials available from industry for use in interior cabins. These materials are selected according to their exceptional self-extinguishing properties. A very high percentage of the materials which are found to pass the present regulations fail to meet these more severe tests.

A test program which is concerned with the upgrading of flame-resistant materials needs to consider, first, the validity of the test methods employed to establish new flame-resistant limits and, second, whether such new limits are adequate. Present standards which are based on Federal Specification CCC-T-191b, May 1951, titled "Textile Test Methods," may be inadequate. This title raises the question whether materials other than fabrics may be justifiably considered to fall in this classification since many of the interior materials now in use consist of sheets, laminates, and assemblies of several components containing plastics, glass, and even paper. A second consideration involves the severity of the test method. The rapid spread of fires throughout the cabins of large transports (Reference 1) was surprising in view of the use of materials presumably flame resistant.

The problem of devising more realistic test methods and criteria has engaged the attention of the leading research and testing laboratories. Test methods (References 4, 5, and 6) utilizing large ignition sources, such as fire tunnels heated by large gas flames and a radiant panel, have been developed for this purpose. These more severe methods are used extensively for hazard classification of building materials. Some of the vinyl-coated fabric materials now supplied to the aviation industry were tested in a 25-foot tunnel and displayed the Underwriters Laboratories, Inc., label (Reference 7). These methods also provide a smoke factor for the burning material. This factor (Reference 8) is receiving increasing interest due to the widespread use of plastics which, in general, produce much larger quantities of smoke than do the cellulose-derived materials.

The use of plastics also has been responsible for the concern of late shown over the problem of toxic gases. Normally, the only toxic gas of sufficient concentration to be dangerous to life is carbon monoxide (References 8 and 9). In the case of some heated or burning plastics, however, other gases more toxic than carbon monoxide may be produced in concentrations sufficient to become hazardous (Reference 10). Toxicity is a difficult problem to analyze (References 11 and 12) since it depends to a large extent on the combustion process in an actual fire. Laboratory tests conducted on small samples of interior materials may not provide complete or sufficient information on this hazard. Further tests utilizing a full-scale test article to simulate an actual fire in an aircraft to more accurately determine toxicity effect of the materials will be undertaken in the future as a second phase of this project.

Fire-retardant treatment is effective both by surface coating of the fabrics (References 13 and 14) and by incorporation of the chemicals within the material itself. Published data, however, show that the effect with plastics is erratic (Reference 15). In contrast, the salts used in the coating of the fabrics are generally effective in making the material more self-extinguishing when used in sufficient quantity. However, the treatment is affected by cleaning agents which dissolve the salts (Reference 16). Therefore, the treatment must be renewed to remain effective.

The work described in this report is concerned mainly with a study of test methods and their application to the fire testing of aircraft interior materials. To insure a satisfactory cross section of all materials in common use in aviation, over 100 materials were selected from among some dozen different sources including two aircraft companies, two airlines and, the rest, materials manufacturers. A majority of these materials may be seen to consist of vinyls and synthetic fibers characteristic of modern interior furnishings.

DISCUSSION

Fire Testing

The ability to resist fire is one of the important properties of materials. Materials used in aircraft and subject to fire are divided into four classifications. These are in order of the severity of the requirements as follows: (1) fireproof, (2) fire resistant, (3) flame resistant, and (4) flash resistant. The division between these classifications is more or less arbitrary and dependent upon the intended use of the material.

Fireproof and fire-resistant materials are generally limited to the metals, fiberglass or asbestos. These materials are tested for flame penetration through the material rather than flame spread.

The 4-inch-per-minute burn rate, which is the upper limit of flame-resistant materials, with which this project is concerned, was established prior to the year 1947. The basis for the acceptance of this figure was the flammability of doped cotton fabric with cellulose acetate butyrate which was used as a standard material and shown to have a burn rate of 2 - 4 inches per minute in tests conducted by the National Bureau of Standards.

The factors which determine the degree of flame resistance are: (1) minimum heat, temperature and time required for the material to ignite, (2) rapidity by which the flames propagate once the material is ignited, (3) tendency of the flames to become self-extinguishing upon removal of the ignition source, and (4) heat generated by the burning material. Other factors related to fire-resistant requirements are smoke and toxicity of the gases produced by the burning material. Various test methods have been designed to measure these factors among which are the methods used in this investigation.

The equipment used in the various tests to compare the ignition time, burning rate, self-extinguishing time and smoke production of a large number of materials was that used by industry and government laboratories. To insure that flame-resistant ratings assigned to the materials are valid and generally acceptable, it is essential that both the equipment and test procedures are standardized. By nature, fire tests are difficult to duplicate; therefore, complete uniformity in test methods is essential. Because of the lack of required test equipment at the National Aviation Facilities Experimental Center (NAFEC), use was made of the facilities of the Fire Protection Section, National Bureau of Standards, Washington, D. C. These facilities included a conditioning chamber for the materials, apparatus for testing materials in a horizontal position as in FSS Release 453, apparatus for testing materials in a vertical position, and apparatus for testing materials subjected to a radiant heat source.

The Radiant Panel Test Apparatus was developed by the National Bureau of Standards and has achieved widespread use in testing laboratories and by materials manufacturers as a research tool. The test method has been adopted as an Interim Federal Standard No. 00136b, December 1962, titled "Flame-Spread Properties of Materials." The

types of materials which may be tested by this method include those in the form of "boards, sheets, structural members, heavy fabrics, finish materials, films or sheets and combinations of any of these." Unlike the Bunsen burner fire tests, this apparatus continues to heat the specimen while it is undergoing test, as would be the case in an actual fire involving other surrounding materials. This consideration is absent in the Bunsen burner tests which only consider the burner flame as the sole source of heat feeding the flames.

In addition to the four different methods by which the materials were compared - FSS Release 453, Horizontal Test Method 5906, Vertical Test Method 5902, and Radiant Panel Test Method - there exists other methods for specific applications in connection with flame-retardant treated textiles, plastics, vinyl-coated glass, and synthetic fabrics. In addition to the six test methods contained in Federal Specification CCC-T-191b, other recognized test methods have been established: (1) National Fire Protection Association (Reference 16), (2) American Society for Testing Materials (References 17 and 18), (3) Society of Automotive Engineers (Reference 19), and (4) Military (Reference 20).

Equipment Description

1. Horizontal Rate of Burning Apparatus: This apparatus is used in both the FSS Release 453 and CCC-T-191b Method 5906, and is shown in Fig. 1. The essential parts of the apparatus consist of a Bunsen burner ignition source, a ventilated metal cabinet for draft-free environment, a specimen holder for rigid specimen support, and a stopwatch.

2. Vertical Rate of Burning Apparatus: This apparatus is used in CCC-T-191b Method 5902, and is shown in Fig. 2. The essential parts of the apparatus are a ventilated metal cabinet for draft-free environment, a Bunsen burner ignition source, a specimen holder for rigid specimen support, a set of weights, and a timer.

3. Radiant Panel Flame-Spread Apparatus: The apparatus is shown in Fig. 3. The essential parts of the apparatus consist of a gas-fired radiant panel heat source, a pilot burner ignition source, a specimen holder, a temperature instrumented stack and a smoke sampler. A brief description of each of these parts follows:

a. Radiant Panel: This provides a radiant heat source to the burning material. The radiant panel consists of a porous refractory material fed from the rear with a premixed gas-air supply. Combustion is nearly completed within the pores of the refractory material providing a uniform temperature of 1238° F. over its entire area. Dimensions of the radiant surface of the panel are 18 by 12 inches. A radiation pyrometer, shown in the photograph, is used to adjust the temperature of the panel.

b. Pilot Burner: This provides a flame to force ignition at the top of the specimen. The burner consists of a short length of 1/8-inch I. D. stainless steel tube with a porcelain nozzle attachment. The burner is fed with acetylene, premixed with air.

c. Specimen Holder: This provides a rigid support for the test specimens and consists of a frame with a clamping arrangement. Overall size of the holder is 19 3/8 by 6 1/4 inches, allowing an exposed surface of 17 5/8 by 5 1/4 inches. The holder is inclined at an angle of 30° away from the radiant panel which is in a vertical position. Markings on the holder at 3-inch intervals are provided for timing flame propagation.

d. Instrumented Stack: This provides means for measuring the heat rise in the exhaust stack due to the burning of the specimen. Eight chromel alumel thermocouples connected in parallel are placed inside the stack to provide an average stack temperature which is recorded continuously. Airflow through the stack and out through the hood is adjusted to a calibrated air velocity of 100 feet per minute with no heating of the panel.

e. Smoke Sampler: This provides means for measuring the smoke density produced by the burning samples. A sample of the exhaust gases and fumes is aspirated from the top of the stack through a filter paper which collects the solid smoke particles.

Laboratory Tests and Measurements

1. Horizontal Rate of Burning Test Procedure

a. Four test specimens, 13 1/4 by 3 inches, were cut from each sample material. The fabrics were cut lengthwise to the warp direction. (FSS Release 453 specifies tests in both directions of the weave to determine the most critical direction.)

b. The specimens in all fire tests were conditioned for at least 12 hours in a room at 73° F. $\pm 5^{\circ}$ F. and a relative humidity of 50 percent \pm 5 percent.

c. The burner flame was adjusted with no air intake to 1 1/2 inches in height.

d. The specimen was clamped in the holder and positioned inside the cabinet with the 3/4 inch of the flame tip directly below the starting edge of the specimen. Ambient temperature inside the cabinet measured between 95° F. and 115° F.

e. Ignition time, or the time required for the material to flame, was recorded from the instant the specimen was slid into position over the burner flame until the specimen started to flame.

f. The flame was removed from the specimen after a 15-second exposure only in the case of the FSS Release 453 tests, but was allowed to remain indefinitely in position for Test Method 5906.

g. Flaming time was measured from the time the specimen ignited to the time the flame was self-extinguished or reached a given calibrated distance marker.

h. Burn length was measured from the start wire position. The specimens which were self-extinguishing and those for which burning did not extend beyond the start wire (less than 1.5 inches) were identified in the tabulation of test data by the numeral I. The specimens which burned beyond the start wire but which were self-extinguishing before reaching the stop wire (less than 11.5 inches) were identified in the tabulation of data by the numeral II. The specimens which burned the full length were considered as non-self-extinguishing and were identified in the tabulation of test data by the letter X.

i. Burn rate was measured by dividing the burn length by the flaming time. Burn rates were obtained for the initial 1.5-inch length of the specimen, the final 10-inch length of the specimen and, also, for burn lengths in between these distances. The flame front on the top of the sample was used in all tests to determine the burn rate. The flame below the specimen, however, generally traveled ahead of the flame on top of the burning specimen but was not as well defined.

j. Smoke, odor and burning characteristics of the specimens were noted and recorded.

2. Vertical Rate of Burning Test Procedure

a. Four test specimens, 12 by 3 inches, were cut from the same sample material, lengthwise to the warp direction.

b. The burner flame was adjusted to 1 1/2 inches in height as in the horizontal tests.

c. The specimen was clamped in the holder, placed inside the cabinet, and hung vertically from a horizontal bar, with the bar extended across the centerline of the cabinet and supported by V-blocks at each end. The specimen was positioned so that its edge was 3/4 inch directly above the center of the burner barrel. The burner was slid into position under the specimen to start the test.

d. Ignition time was measured from the instant the burner was placed under the specimen until the time the specimen began to flame.

e. The burner was removed from beneath the specimen after a 14-second exposure and the test continued.

f. Flaming time was measured from the time the burner was withdrawn until the time the flame was self-extinguished, or until the full length of the sample was burned.

g. Glow time was measured from the instant flaming stopped until the specimen ceased to emit light.

h. Burn length was measured as in the horizontal tests.

i. Char length was measured as the length of the material damaged by the fire, evidenced by tearing of the material by suspending to it specified weights. Char length was normally less than burn length since the former represented the more severely damaged areas from burning.

j. Smoke, odor and burning characteristics of the specimen were noted. Ignition time was usually easily observed since there was a

definite change in the color and shape of the burner flame. Some of the materials such as synthetic fibers melted and fell as flaming droplets which present a problem. Other materials burned so vigorously that the flames reached to the top of the cabinet.

k. Burn rate was calculated by dividing the burn length by the total flaming time including the 12-second burner exposure time, but minus the ignition time. Specimens which did not burn the entire 12-inch length were considered as self-extinguishing and were identified in the test data by the numeral I. Specimens which burned completely were considered non-self-extinguishing and were identified by the letter X.

3. Radiant Panel Flame Spread Test Procedure

a. Four test specimens, 18 by 6 inches, were cut from each sample material lengthwise to the warp direction.

b. A calibration of the apparatus was made to determine proper radiant panel and stack temperatures.

c. A filter disk was weighed and placed in the smoke sampler.

d. The specimen was placed in the holder and covered with a 1-inch mesh poultry netting. The netting was placed over the exposed area of the specimen for mechanical support. A 1/2-inch thick millboard was placed in the holder for backing up the specimen with a 1/2-inch air gap separating the specimen from the millboard.

e. The pilot burner was ignited and brought into position.

f. The specimen holder was placed into position with the specimen in contact with the pilot flame to initiate the fire test.

g. Ignition time was measured from the instant the specimen was in contact with the pilot flame until the time flaming of the material was first evidenced by a change in the pilot flame.

h. Burn length was measured from observation of the sustained and continuous flaming of the material down the length of the specimen. Time of arrival of the flame front at each succeeding 3-inch interval marker was measured. Flash fires moving up and down the specimen were observed with some materials. These were disregarded in the calculations. Burn length was measured from the last 3-inch marker

past which the flame was observed to have crossed. Actual burn length as such was not recorded. Instead, the flaming times for the flame front to reach the successive 3-inch positions are obtained for use in the calculation of all Flame-Spread Indexes.

i. Burn rate was obtained by dividing the first 3-inch increment length of the specimen by the time required, after ignition, for the flame to reach the 3-inch marker.

j. A smoke factor was determined as the difference in the weight to the nearest 0.1 milligram (mg.) of the filter paper before and after the fire test.

k. A heat factor was determined directly from the rise in stack temperature resulting from the combustion of the test specimen as compared to that of an asbestos-cement board under the same standard test conditions.

l. Flame-Spread Index was calculated by combining the flame propagation velocity and the heat evolution test values as shown by formulas in the Interim Federal Standard No. 00136b for the Radiant Panel Apparatus.

m. Coefficient of variation of the Flame-Spread Index between specimens of the same sample material was calculated by standard statistical methods.

n. Smoke and burning characteristics of the specimen were noted.

4. New, Used and Dry Cleaned Materials Test: Fabric and rug materials were received from one source for more direct and easier comparison. Both new and used materials of the same type were dry cleaned. New and dry cleaned specimens were obtained from the same sample material. Used materials were received in the soiled condition that would be typical of normal maintenance routine. The materials were cleaned in accordance with a major air carrier's recommendation and in a commercial plant. The rug material was cleaned with a recommended shampoo and the fabrics were cleaned in Stoddard solvent. Test procedures were identical to those employed in other tests.

Test Results and Analysis

1. Horizontal Burn Rate Tests: The materials used in all fire tests are listed and described in Appendix I. The test results are tabulated in Appendix 2, Tables I and II. A summary of the test data is presented in Table I of the text. Typical fire damage to a high and a low flammable material is shown in Figs. 4 and 5.

The data show the following characteristics for the materials subjected to the standard fire tests:

93 materials tested, of which -

- 81 were self-extinguishing within a burn length of 11.5 inches.
- 60 were self-extinguishing within a burn length of 1.5 inches.
- 12 were non-self-extinguishing and burned their full length.
- 4 alone were non-self-extinguishing with an average burn rate of 4 inches per minute or greater. This burn rate exceeds the limit specified in FSS Release 453. In addition, three more materials may be considered marginal failures in that one specimen out of four also exceeded this limit.
- 70 were self-extinguishing with a burn rate of 0 - 1 inch per minute.
- 23 were self-extinguishing within a 0.50-minute flaming time.

(Note that Test Method 5906 is a somewhat more severe test method than FSS Release 453 since the burner is not removed after a 0.25-minute flame exposure.)

The above statistics show that the most flammable materials were the fabrics and rugs as these showed the highest flaming time, burn length and burn rate. The uncoated fabrics were generally more flammable than

the coated fabrics. Twelve of the 19 synthetic fiber uncoated fabrics showed a flaming time longer than 2 minutes, while 9 of these showed a burn rate of 2 - 3 inches per minute. Of those nine materials, seven were non-self-extinguishing and burned the full length. The coated fabrics were generally less flammable than the uncoated fabrics such as the synthetic fibers; however, three out of the four materials which failed the FSS Release 453 tests, or equivalent, belong to this category and were outstanding exceptions. These three materials were the simulated leatherettes of vinyl-coated cotton fabric construction. In contrast to the vinyl-coated cotton fabrics, all vinyl-coated fiberglass and dynel fabrics showed no appreciable burning, as well as more rapid extinguishment within 0.50 minute. None of the vinyl sheet materials were self-extinguishing within less than 1.0 minute although the burn rate was within 1.0 inch per minute and the burn distance within 3.0 inches.

Only two other materials besides the fabrics and rugs showed any appreciable burn length. These were plexiglass and neoprene sponge. Neoprene sponge was the only material other than the three fabrics with a burn rate exceeding 4 inches per minute.

The least flammable materials were the heavier and thicker samples such as the laminates and assemblies which generally showed little or no burning. In some cases, although burn rate and distance were negligible, flaming time was considerable due to slow burning.

No direct correlation between flammability and flame-retardant treatment was evident on the basis of scattered tests and the insufficient information on the formulation of the materials obtained from suppliers. In addition to the 11 materials marked as fire-retardant treated, it was known that many other materials also had been treated for aircraft use although no confirmation of this was obtained in writing. Of the 11 fire-retardant materials, only 2 showed a burn length in excess of 1.5 inches.

The effect of both use and cleaning on the flame resistance of the material was not apparent on the four uncoated fabrics and three rug materials tested. No information of any chemical coatings that could have been applied in the manufacture of these materials to decrease their flammability was available. Therefore, it was not possible to infer any effect from the leaching out of the chemical salts deposited in the fabrics which may result from dry cleaning. Presumably, many of the fabrics, plastics, and paper listed had some degree of flame-retardant

treatment. The fire-retardant chemicals are incorporated within the vinyl materials rather than deposited on the surface as in fabrics; therefore, these materials were not affected by the solvent action of cleaning agents.

Test results utilizing FSS Release 453 Test Method for comparison to Test Method 5906 are contained in Appendix 2, Table II.

2. Vertical Burn Rate Tests: A summary of the test results contained in Appendix 2, Table III, is presented in Table II of the text. The data show the following characteristics of the materials tested:

93 materials tested, of which -

- 67 were self-extinguishing within a burn length of 12 inches.
- 37 were self-extinguishing within a burn length of 3.0 inches.
- 26 were non-self-extinguishing and burned their full length.
- 59 were self-extinguishing within a 0.50-minute flaming time following burner flame removal.
- 31 were self-extinguishing with a burn rate of 0 - 10 inches per minute.

The above statistics show that the most flammable materials were again the fabrics and rugs, especially the uncoated fabrics. Burn rates of greater than 30 inches per minute were obtained for four fabrics including two dacrons. Only 9 of the 19 uncoated fabrics were self-extinguishing and only 4 of those within 0.50 minute. These latter materials were the dacron or nylon fabrics. In contrast, 21 of the 28 coated fabrics were self-extinguishing within 0.50 minute. This number included the 11 coated fiberglass fabrics and the 4 coated dynei fabrics, the latter which showed zero flaming time. The most flammable fabrics were again the vinyl-coated cotton materials. Of 13 such materials, 5 were non-self-extinguishing and burned the full length. These again included the simulated leatherettes..

All uncoated fabrics showed a burn length of 3.0 inches or more. In contrast, 13 of the 28 coated fabrics showed a burn length of 3.0 inches or less. Both flaming time and burn length were generally greater, while the corresponding burn rate was less for the uncoated than the coated fabrics. The majority of the coated fabrics burned at the rate of 10 - 20 inches per minute compared to 10 inches per minute or less for the uncoated fabrics.

Only one of the two leathers was self-extinguishing.

Out of seven rugs, four were self-extinguishing but the time exceeded 2.0 minutes, which was also typical of the heavier, slower burning sheet materials.

It should be noted that in the vertical test method, in contrast to the other methods, both sides of the materials are subject to the burner flame. In the case of the rugs, both the face and the padding, or backing laminate, were exposed to the burner flame. Thus, in one test the foam rubber backing burned completely while the wool face material burned less than 3.0 inches. The vertical test is severe for materials with a flammable exposed undercoating.

The least flammable materials were again the heavier and thicker rigid laminates and assemblies.

Again, no positive effect of fire-retardant treatment in reducing the flame resistance of the materials was evident.

Further, definite test results showing that either the new, used, or dry cleaned condition of the material affected its flammability were scattered and inconclusive.

3. Radiant Panel Flame-Spread Index and Smoke Factor Tests: A summary of the test results contained in Appendix 2, Table IV, is presented in Table III of the text. The test data show the following characteristics for the materials:

98 materials tested, of which -

65 were self-extinguishing within a burn length of 15 inches.

44 had a Flame-Spread Index rating of 0 ~ 50.

- 28 had a Flame-Spread Index rating of 0 - 30.
- 54 had a smoke factor of 0 ~ 2 mg.
- 34 had a smoke factor of 0 ~ 1 mg.
- 29 had a Flame-Spread Index rating of 0 - 50
and smoke factor of 0 - 2 mg.
- 25 had a Flame-Spread Index rating of 0 - 30
and smoke factor of 0 ~ 2 mg.
- 18 had a Flame-Spread Index rating of 0 - 30
and smoke factor of 0 ~ 1 mg.

The above statistics show that all categories of materials, in contrast to the burner flame tests, are flammable and will burn. The greater severity of the fire tests with the Radiant Panel burns the heavier and thicker materials that remain unaffected by the Bunsen burner flame, thus providing flammability test data for all categories of interior materials. The tendency of the Radiant Panel tests is to raise the flammability ratings of the fabrics with reference to the other categories of materials which is just the opposite of that which is shown by both the horizontal and vertical burn rate tests.

Since the Flame-Spread Index is determined in part by the heat generated by the burning samples, a dependence on weight of the combustible materials should be expected. Thus, materials which showed the smallest index ratings, therefore the best flame characteristics, were seen to be the fabrics, especially the very sheer and light-weight synthetics. Outside of this group, the vinyl and mylar-clad aluminum laminates also had exceptionally good (low) Flame-Spread Index characteristics. All five vinyl laminates in this group showed a Flame-Spread Index rating below 50 and a smoke factor below 2.0 mg.

Outstanding performance was shown by the vinyl-coated dynel fabrics and the sheer uncoated dacron fabrics. The six fabrics of this type having an average weight of less than 0.7 pound per square yard showed a Flame-Spread Index rating of only 0 - 10 and a smoke factor less than 1.0 mg. In addition to their light weight, the dynel fabrics apparently owe much of their exceptional low Flame-Spread Index characteristics to the tendency of the material to shrivel up and pull away from the flame or heat, thus decreasing its susceptibility to fire. Nylons definitely

tended to show an increase in Flame-Spread Index with weight and, likewise, for addition of metal fibers to the fabric. Out of 15 materials with a Flame-Spread Index rating of 0 - 10, 9 were fabrics; while out of 28 materials with a Flame-Spread Index rating of 0 - 30, 13 were fabrics.

The vinyl-coated fiberglass fabrics again showed superiority over the vinyl-coated cotton fabrics by comparison of the index ratings. Out of a total of 10 fiberglass fabrics, 6 had an index rating of 0 - 50. Out of a total of 10 cotton fabrics, 5 had an index rating of 300 plus. Only two of the cotton fabrics had an index rating of 0 - 50.

The two leathers showed a Flame-Spread Index rating of 100 - 300 with a relatively low smoke factor of 0 - 1 mg.

The five rugs also showed a Flame-Spread Index rating of 100 - 300 but with a much higher smoke factor with the exception of one rug.

Sheet materials showed considerable variation in index ratings. These included the two neoprene foams with a Flame-Spread Index rating over 1500. In contrast, some vinyls and one neoprene showed an index rating as low as 0 - 10 which may have been due to the exceptional fire-retardant treatment of the particular material.

Of 13 assemblies, 6 showed a Flame-Spread Index rating of 0 - 50. Five of these six materials had a vinyl or plastic fiberglass covering or were vinyl-bonded to aluminum. The sixth was an assembly with a plastic covering on polyester sheet backing.

Four of the five paper honeycomb assemblies had a Flame-Spread Index rating of 50 - 100, and one had a Flame-Spread Index rating of 30 - 50.

The smoke factor generally increased with the thickness or weight of the material as well as with the Flame-Spread Index. Vinyls, as is well known, were shown to be very productive of smoke, especially the heavier vinyl sheets.

Further, the vinyl-coated fabrics with an index rating of 0 - 50 also showed a large smoke factor of nearly 2 mg. which was twice that for the uncoated fabrics.

Reflectivity of the materials was expected to be a factor in reducing the Flame-Spread Index, particularly in this test method employing radiant heat. This was shown to be the case for two mylar sheets, one of which was aluminized and both identical except for reflectivity.

Backing of the material was expected to be a factor affecting the Flame-Spread Index because of the severity of the test method. This was shown by testing separately the materials making up the whole assembly. One assembly showed a small change in index because its immediate backing material was less flammable than the surface material. In this case, the 1-inch thick more highly flammable paper core was too far removed from the heated surface material to affect the index of the whole assembly. In contrast, another assembly showed that the more exposed highly flammable polyether foam backing significantly increased the index of the fabric covering.

Test results on the effect of fire-retardant treatment on the Flame-Spread Index were conflicting in that these results indicated, if anything, a slight increase in the Flame-Spread Index.

Test results showing the effect of use and cleaning of the materials on the Flame-Spread Index were again inconclusive. Only one rug material showed a definite increase in index with use and after shampooing. However, the effect of increasing significantly the index of one low index curtain material by spot cleaning with perchloroethylene was shown.

The two detergents, one deodorant, and perchloroethylene used in cleaning aircraft materials were shown not to be flammable by a wick test.

4. Comparison of Test Methods and Results: A comparison of the test data obtained by the different test methods shows that:

a. Burn rate by the vertical test method was of the order of 10 times more rapid than that by the horizontal test method with comparative increase in burn length.

b. Self-extinguishing time by either the horizontal or vertical test method was of the same order of magnitude.

c. Burn rate measurements by the FSS Release 453 Test Method closely agreed with those obtained by Test Method 5906 (Horizontal) since the two methods are essentially the same.

d. The vertical test method is somewhat more severe than the horizontal test method in that fewer materials were shown to be self-extinguishing. A burn length of 12 inches by the vertical test method was roughly equivalent to a burn length of 1.5 inches by the horizontal test method.

e. The majority of materials were self-extinguishing by both test methods; therefore, this property may be used as a test criteria for the flame resistance of materials by either method in the place of the less severe requirement of a given maximum burn rate. This test criteria is especially applicable to the vinyls which by nature are self-extinguishing. In the case of the uncoated fabrics, however, a self-extinguishing requirement would be severe since about one-third of the materials tested would fail to meet this requirement in the horizontal test method, and about one-half in the vertical test method.

f. Tests showed that a requirement for flame resistance based on a given burn length rather than on a burn rate is the more practical of the two for the self-extinguishing materials which comprise the bulk of the materials tested by both methods. This is because burn rate measurements in the horizontal test method are considered valid only outside the influence of the burner flame (start wire - 1.5 inches). It has significance and is applicable only to the more flammable materials which show continuous burning with a well-defined self-sustained flame over the entire length of the test sample. It should be noted, however, that the majority of materials were self-extinguishing before reaching the start wire; hence, no burn rate figures would be available if this test alone were used.

g. Tests showed that the flame resistance by the vertical test method based on a maximum self-extinguishing time of 0.50 minute is about equal to a maximum burn length of 1.5 inches by the horizontal test method.

h. The majority of the materials were self-extinguishing within less than 1.0 minute by either the vertical (75 percent) or horizontal (50 percent) test methods.

i. The Radiant Panel Test Method is the most severe of the four test methods.

j. The Radiant Panel Test Method is relatively less severe on the fabrics than on the heavier and thicker materials in comparison to the Bunsen burner test methods which show the opposite results.

k. The Radiant Panel Test Method alone, due to its large heat source, has the capacity to penetrate the thin covering materials of some assemblies to indicate to some extent the flame resistance of the immediate backing component material.

l. The Radiant Panel Test Method is the only method that yields a Flame-Spread Index rating which takes into account the heat generated by the burning sample.

m. The Radiant Panel Test Method is the only method that yields a smoke factor value in addition to a rating for flame resistance.

n. Although the Radiant Panel Test Method is fundamentally different than the Bunsen burner test methods, low Flame-Spread Index ratings for the materials tested, nevertheless, are in good agreement with requirements for both short burn length and rapid self-extinguishing time to indicate superior flame-resistant requirements by either test method. Thus, of a total of 29 materials with a Flame-Spread Index of 0 - 50 and a smoke factor of 0 - 2 mg., 25 of these materials show both a burn length of less than 1.5 inches (by the horizontal test method) and a self-extinguishing time of less than 0.50 minute (by the vertical test method). The four materials which are exceptions and do not meet all three conditions listed above are the nylons. Because these materials melt and drip in the Radiant Panel Test Method, it was difficult to obtain reproducible data using this method.

CONCLUSIONS

Based on an analysis of the test results obtained on 109 different aircraft interior materials and from a comparison of the four test methods to achieve these results, it is concluded that:

1. The FSS Release 453 Test Method is not a suitable test procedure for materials other than fabrics.
2. There are many materials presently available and in use today which are self-extinguishing and which far exceed the flame-resistant characteristics required by a 4-inch-per-minute maximum burn rate.
3. On the basis of the tests conducted, the vertical test method is a satisfactory alternate to FSS Release 453 as a test method for fabrics that are self-extinguishing.
4. The Radiant Panel Test Method is capable of covering the entire flammability range of the interior materials tested, thus providing Flame-Spread Index ratings indicative of the degree of flame resistance.
5. The large number of interior materials containing vinyls or other plastics produce greater quantities of smoke during burning than do the cellulose-derived materials of the same flammability range.
6. The effect of the condition of the material whether new, used, or cleaned on the flame resistance of the fabrics and rugs tested was not significant.

REFERENCES

1. Cabin Fire Incident and Investigation TWA Boeing 707-131, Plane 7739, Trans World Airlines, Inc., Engineering Report No. 1203.
2. Evaluation of Interior Materials for the 707 Airplane, Boeing Airplane Company, Document No. D6-1084, dated 1957.
3. Convair 880 Cabin Interior Furnishings Flame Tests and Electrical Equipment and Wiring Studies, Reports Nos. ZM-22-086 and MP-61-098M, dated 1961.
4. Federal Fire Council Minutes of Meeting, April 17, 1962, Various Surface Flame-Spread Test Methods for Building Finish Materials, Federal Fire Council, Washington 25, D. C.
5. Robertson, Dr. A. F., Surface Flammability Measurements by Radiant-Panel Method, National Bureau of Standards Paper No. 191.
6. Robertson, Dr. A. F., Gross, D., and Loftus, J., A Method for Measuring Surface Flammability of Materials Using Radiant Energy Source, National Bureau of Standards Paper No. 87.
7. Building Materials List, January 1963, Underwriters Laboratories, Inc., Pages 68 - 69.
8. Fire Protection Handbook, Twelfth Edition, 1962, National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.
9. Colman, E. H., FRIC, Gaseous Combustion Products from Plastics, Department of Scientific and Industrial Research and Fire Offices.
10. Watson, H. A., Stark, H. J., Beatty, R. L., Busch, H. W., and Berger, L. B., Thermal Decomposition Products and Burning Characteristics of Some Synthetic Low-Density Cellular Materials, Bureau of Mines Report No. 4777.
11. Watson, H. A., Stark, H. J., Sieffert, L. E., and Berger, L. B., Decomposition Temperatures of Polytetrafluoroethylene and Poly-monochlorotrifluoroethylene as Indicated by Halogen Liberation, Bureau of Mines Report No. 4756.

12. Schiesheim, Alan, Method for the Controlled Burning of Combustible Materials and Analysis of the Combustion Gases, Journal of Research of the National Bureau of Standards, Vol. 57, No. 4, October 1956, Research Paper 2715.
13. Sandhozer, Marjorie W., Some Properties of Flameproof Fabrics, National Bureau of Standards, Reprint from American Dyestuff Reporter, Vol. 48, No. 2, Pages 37 - 41, Issue of January 26, 1959.
14. Guthrie, John D., Drak., George L., Jr., and Reeves, Wilson, Application of the THPC Flame-Retardant Process to Cotton Fabrics, Reprint from American Dyestuff Reporter.
15. Gross, Daniel, and Loftus, Joseph J., Flame Spread Properties of Building Finish Materials, National Bureau of Standards, Reprint from American Society for Testing Materials Bulletin No. 230, May 1958.
16. Standard for Flameproofed Textiles, National Fire Protection Association, NFPA No. 701-1951.
17. Technical Data on Plastics, Manufacturing Chemists' Association, Inc., 1625 Eye Street, N. W., Washington 6, D. C.
18. Flammability of Plastics 0.050 Inches and Under in Thickness, American Society for Testing Materials, ASTM Designation: D568-61.
19. Flame-Resistance Treatment of Interior Fabrics, Society of Automotive Engineers, AMS 3855A - 1954.
20. Cloth, Coated, Synthetic and Fibrous Glass, Military Specification, MIL-C-751B (ASG), April 15, 1955.

ACKNOWLEDGMENTS

The authors wish to acknowledge Dr. A. F. Robertson, Dr. Marjorie W. Sandholzer, Mr. D. Gross and Mr. J. Loftus of the National Bureau of Standards, Fire Protection Section, for their valuable assistance in conducting these tests. The authors are also indebted to the many fabrics manufacturers and airlines for furnishing the materials that were tested.

TABLE I
DATA SUMMARY FOR HORIZONTAL TESTS - METHOD 5906

Material No.	Code	Class I II X	Flaming Time (min.)					Burn Rate ⁽¹⁾ (in./min.)					Total Burn Length (in.)			
			0	0.5	1.0	2.0	2.0+	0-1	1+	2-3	3-4	4+	1.5-	3.5-	7.5-	
2	F1	O						O		O						O
3		O						O		O						
4		O						O		O						
6		O						O		O						
7		O						O		O						
8		O						O		O						O
13		O						O		O						
14		O						O		O						
15		O						O		O						O
16		O						O		O					O	
17		O						O		O					O	
18		O						O							O	
19		O						O							O	
20		O						O		O						O
*42		O						O		O						
43		O						O		O						
*44		O						O		O						O
*45		O						O		O						
*70		O						O		O						
5	F2	O						O							O	
9		O						O								
21		O						O								
22		O						O								
23		O						O							O	
24		O						O							O	
28		O						O							O	
36		O						O							O	
37		O						O							O	
38		O						O							O	
40		O						O							O	
*46		O						O								
48		O						O								
49		O						O							O	
50		O						O							O	
51		O						O								
52		O						O								
53		O						O								
54		O						O								
55		O						O								
56		O						O								
60		O						O								
61		O						O								
62		O						O								
63		O						O								
64		O						O							O	
65		O						O								
*92		O						O								
*93		O						O								
*94		O						O								

*Flame-retardant treatment.

Code

F - Fabric

 1 - Uncoated, 2 - Coated, 3 - Leather

R - Rug

 1 - Unpadded, 2 - Padded

S - Sheet, L - Laminate, A - Assembly

 1 - Flexible, 2 - Semi-rigid 3 - Flexible

Class

I Burned less than 1.5 inches (start wire).

II Burned less than 11.5 inches (stop wire).

X Burned full length.

Note (1) Burn rate measured from start wire.

TABLE I (Continued)

DATA SUMMARY FOR HORIZONTAL TESTS - METHOD 5906

Material No.	Class	Code	Flaming Time (min.)					Burn Rate ⁽¹⁾ (in./min.)					Total Burn Length (in.)				
			0	0.5	1.0	2.0	2.0+	0-1	1-2	2-3	3-4	4+	1.5-	3.5-	7.5-	11.5	
67	F3	C						O	O				O				
89		O						O	O				O				
1	R1	O						O	O								
12		O						O	O				O				
26		O						O	O								
41		O						O	O				O				
100		O						O	O								
27	R2	O						O	O				O	O			
99		O						O	O				O				
10	S1	O						O	O								
47		O						O	O				O				
66		O						O	O								
68		O						O	O								
91		O						O					O				
95		O						O									
96		O						O									
97		O						O									
98		O						O									
107		O						O									
108		O						O									
35	S2	O						O									
69		O						O									
11	S3	O						O									
*30		O						O									
*31		O						O									
32		O						O									
*33		O						O					O				
34		O						O						O			
77		O						O					O	O			
25	L1	O						O									
29		O						O									
57		O						O									
58	L2	O						O									
59		O						O									
85	L3	O						O									
86		O						O									
87		O						O									
88		O						O									
76	A	O						O									
80		O						O									
81		O						O									
82		O						O									
83		O						O									
84		O						O									
Total	93	60	21	12	5	18	22	16	32	70	5	12	2	4	8	9	4

*Flame-retardant treatment.

Code

Class

F - Fabric

1 - Uncoated, 2 - Coated, 3 - Leather

I Burned less than 1.5 inches (start wire).

R - Rug

1 - Unpadded, 2 - Padded

II Burned less than 11.5 inches (stop wire).

S - Sheet, L - Laminate, A - Assembly

1 - Flexible, 2 - Semi-rigid, 3 - Flexible

X Burned full length.

Note (1) Burn rate measured from start wire.

TABLE II
DATA SUMMARY FOR VERTICAL TESTS - METHOD 5902

Material No.	Code	Class I	Flaming Time ⁽¹⁾ (min.)					Burn Rate (in./min.)					Burn Length (in.)				
			0	0.5	1.0	2.0	2+	0	10	20	30	30+	0	3	6	9	12
2	F1	O						O									O
3	O		O										O				O
4	O		O										O				O
6	O			O									O				
7	O				O								O				
8	O					O							O				O
13	O						O						O				
14	O						O						O				
15	O						O						O				O
16	O						O						O				O
17	O						O						O				
18	O						O						O				
19	O						O						O				O
20	O						O						O				O
*42	O						O						O				
43	O						O						O				
*44	O						O						O				O
45	O						O						O				
*70	O						O						O				O
5	F2	O	O										O				O
9	O		O										O				O
21	O			O									O				O
22	O		O										O				O
23	O			O									O				O
24	O		O										O				O
28	O		O										O				O
36	O				O								O				
37	O					O							O				
38	O					O							O				
40	O					O							O				
*46	O					O							O				O
48	O		O										O				O
49	O			O									O				O
50	O				O								O				
51	O		O										O				O
52	O			O									O				O
53	O		O										O				O
54	O			O									O				O
55	O		O										O				O
56	O			O									O				O
60	O		O										O				O
61	O			O										O			O
62	O		O											O			O
63	O			O													O
64	O			O									O				
65	O			O									O				O
*92	O			O									O				O
*93	O			O									O				O
*94	O			O									O				O

*Flame-retardant treatment

Code

F - Fabric

 1 - Uncoated, 2 - Coated, 3 - Leather

R - Rug

 1 - Unpadded, 2 - Padded

S - Sheet, L - Laminate, A - Assembly

 1 - Flexible, 2 - Semi-rigid, 3 - Rigid

Class

I Burned less than 12 inches.

X Burned full length.

Note (1) Measured after 12-second burner removed.

(2) Sample only 8 inches long.

TABLE II (Continued)

DATA SUMMARY FOR VERTICAL TESTS - METHOD 5902

Material No.	Code	Class I X	Flaming Time ⁽¹⁾ (min.)					Burn Rate (in./min.)					Burn Length (in.)					
			0	0.5	1.0	2.0	2+	0	10	20	30	30+	0	3	6	9		
67	F3	O			O													
89		O				O											O	
1	R1	O			O												O	
12		O				O											O	
26		O				O											O	
41		O				O											O	
100		O			O												O	
27	R2	O				O											O	
99		O			O												O	
10	S1	O			O								O				O	
47		O				O							O				O	
66		O			O								O				O	
68		O				O							O				O	
95		O			O								O				O	
96		O			O								O				O	
97		O				O							O				O	
98		O				O							O				O	
107		O			O								O				O	
108		O			O								O				O	
*109(2)		O				O							O				O	
35	S2	O				O							O				O	
69		O			O								O				O	
11	S3	O			O								O				O	
*30		O			O								O				O	
*31		O			O								O				O	
32		O				O							O				O	
*33		O				O							O				O	
34		O			O								O				O	
77		O				O							O				O	
25	L1	O			O								O				O	
29		O			O								O				O	
57		O			O								O				O	
58	L2	O			O								O				O	
59		O			O								O				O	
85	L3	O			O								O				O	
86		O			O								O				O	
87		O			O								O				O	
88		O			O								O				O	
76	A	O			O								O				O	
80		O				O							O				O	
81		O				O							O				O	
82		O				O							O				O	
83		O				O							O				O	
84		O				O							O				O	
Total	93	67	26	37	22	11	14	9	12	39	28	7	7	12	25	17	10	4

*Flame-retardant treatment

Code

Class

F - Fabric

1 - Uncoated, 2 - Coated, 3 - Leather

I Burned less than 12 inches.

X Burned full length.

R - Rug

1 - Unpadded, 2 - Padded

Note (1) Measured after 12-second burner removed.

S - Sheet, L - Laminate, A - Assembly

1 - Flexible, 2 - Semi-rigid, 3 - Rigid

(2) Sample only 8 inches long.

TABLE III
DATA SUMMARY FOR RADIANT PANEL TESTS

Material No. Code	Flame Spread Index - I_s						Smoke Factor - (mg.)					Burn Rate (Initial 3" Length) (in./min.)			
	0- 10	10- 30	30- 50	50- 100	100- 300	300+	0- 0.5	0.5- 1.0	1.0- 2.0	2.0- 3.0	3.0+ 3.0+	0- 5	5- 10	10- 25	25+
2 F1	O						O					O			
3	O						O					O			
4	O						C					O			
6			O				O					-			
7			O				O					-			
8		O								O		-			
13			O				O					O			
14			O				O					O			
15		O							O			O			
16		O					O					O			
17			O					O		O		O			
18			O					O		O		O			
19	O						O					O			
20	O						O					O			
*42			O				O		O			O			
43			O				O					O			
*44			O						O			O			
45			O					O				O			
*70	O						-					O			
5 F2			O						O			-			
9	O						O					-			
21		O						O		O		O			
22	O							O				O			
23			O						O			O			
24		O							O			O			
28	O							O				O			
36		O							O			O			
37		O							O			O			
38		O							O			O			
40		O						O		O		O			
*46		O							O		O	O			
48	O								O		O	O			
49			O						O		O	O			
50			O						O		O	O			
51		O							O			O			
52	O								O			O			
53	O								O			O			
54		O							O			O			
55	*		O						O			O			
56		O						O		O		O			C
60		O							O		O		O		
61	O							O				-			
62	O							O				-			
63	O							O				-			
64			O						O		O				O
65	O								O		O		-		
67 F3			O					O				O			O
89			O					O		O					O
1 R1	O									O		O			O
12			O						O		O			O	
26			O							O		O			
41			O								O	O			

*Flame-retardant treatment

- Complete information not available

Code: F - Fabric

R - Rug

S - Sheet, L - Laminate, A - Assembly

1 - Uncoated, 2 - Coated,

1 - Unpadded

1 - Flexible, 2 - Semi-rigid,

3 - Leather

2 - Padded

3 - Rigid

TABLE III (Continued)
DATA SUMMARY FOR RADIANT PANEL TESTS

Material No. Code	Flame Spread Index - I_s						Smoke Factor - (mg.)					Burn Rate (Initial 3" Length) (in./min.)				
	0- 10	10- 30	30- 50	50- 100	100- 300	300+ 300+	0- 0.5	0.5- 1.0	1.0- 2.0	2.0- 3.0	3.0+ 3.0+	0- 5	5- 10	10- 25	25+ 25+	
27 R2						O					O			O		
10 S1						O					O			-		
47						O					O			O		
66						O					O			O		
68						O					O			O		
90						O					O			O		
91						O					-			O		
95						O					O			O		
96						O					-			O		
97						O					-			O		
98						O					-			O		
107						O					O			-		
108						O					O			-		
*109						O					O			O		
35 S2						O					O			O		
69						O					O			-		
11 S3						O					O			O		
*30						O					O			O		
*31						O					O			O		
32						O					O			O		
*33						O					O			O		
34						O					O			O		
77						O					O			O		
25 L1						O					O			O		
29						O					O			O		
57						O					O			O		
39 L2						O					O			O		
58						O					O			O		
59						O					O			O		
85 L3						O					O			O		
86						O					O			O		
87						O					O			O		
88						O					O			-		
71 A						O					O			-		
72						O					O			O		
73						O					O			O		
74						O					O			O		
75						O					O			-		
76						O					O			O		
78						O					O			O		
79						O					O			-		
80						O					O			O		
81						O					O			O		
82						O					O			O		
83						O					O			O		
84						O					O			O		
Total	98	15	13	16	16	24	14	16	18	20	13	26	23	24	25	9

*Flame-retardant treatment

- Complete information not available

Code: F - Fabric

R - Rug

S - Sheet, L - Laminate, A - Assembly

1 - Uncoated, 2 - Coated,
3 - Leather

1 - Unpadded
2 - Padded

1 - Flexible, 2 - Semi-rigid,
3 - Rigid

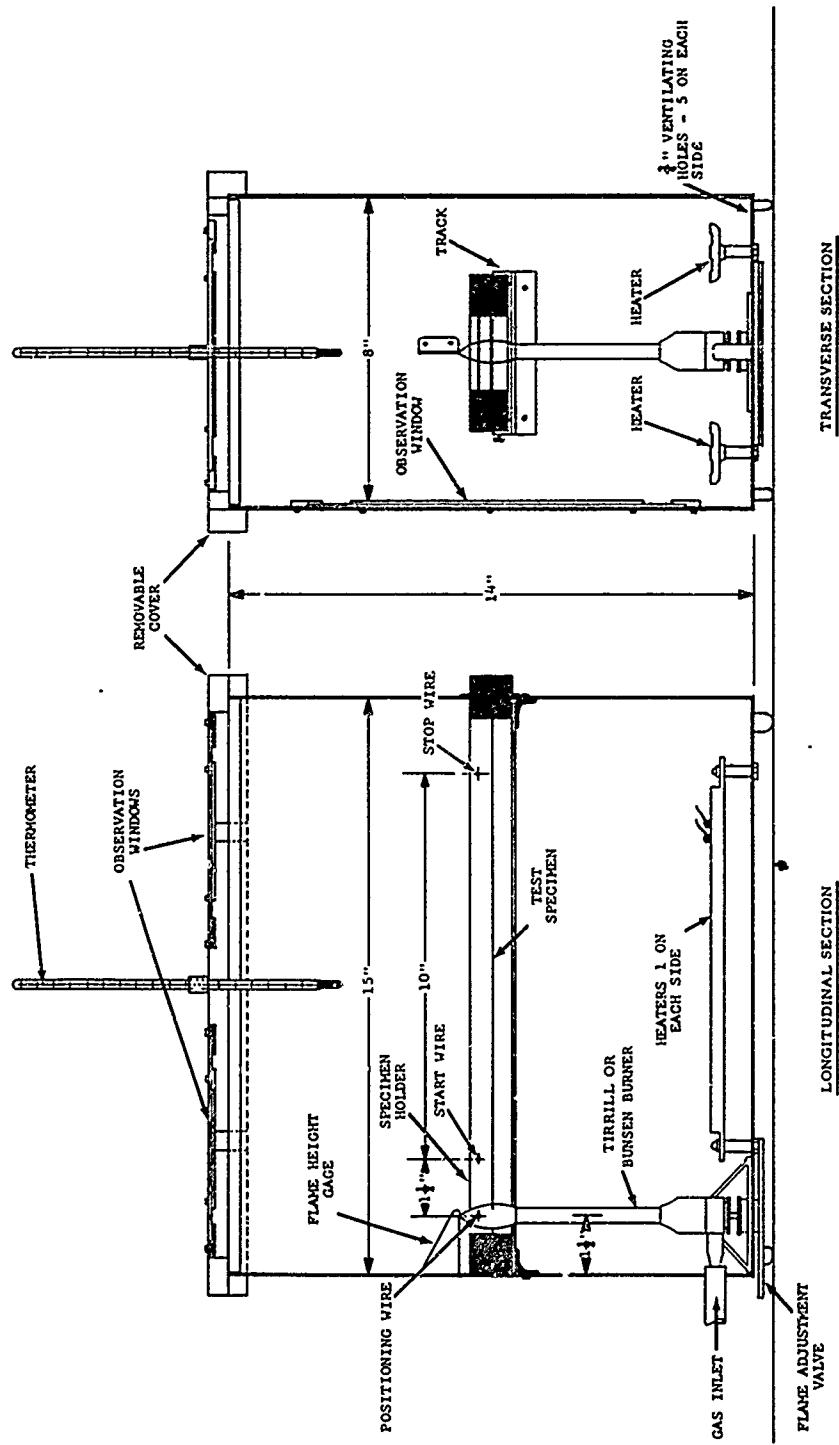


FIG. 1 HORIZONTAL RATE OF BURNING APPARATUS

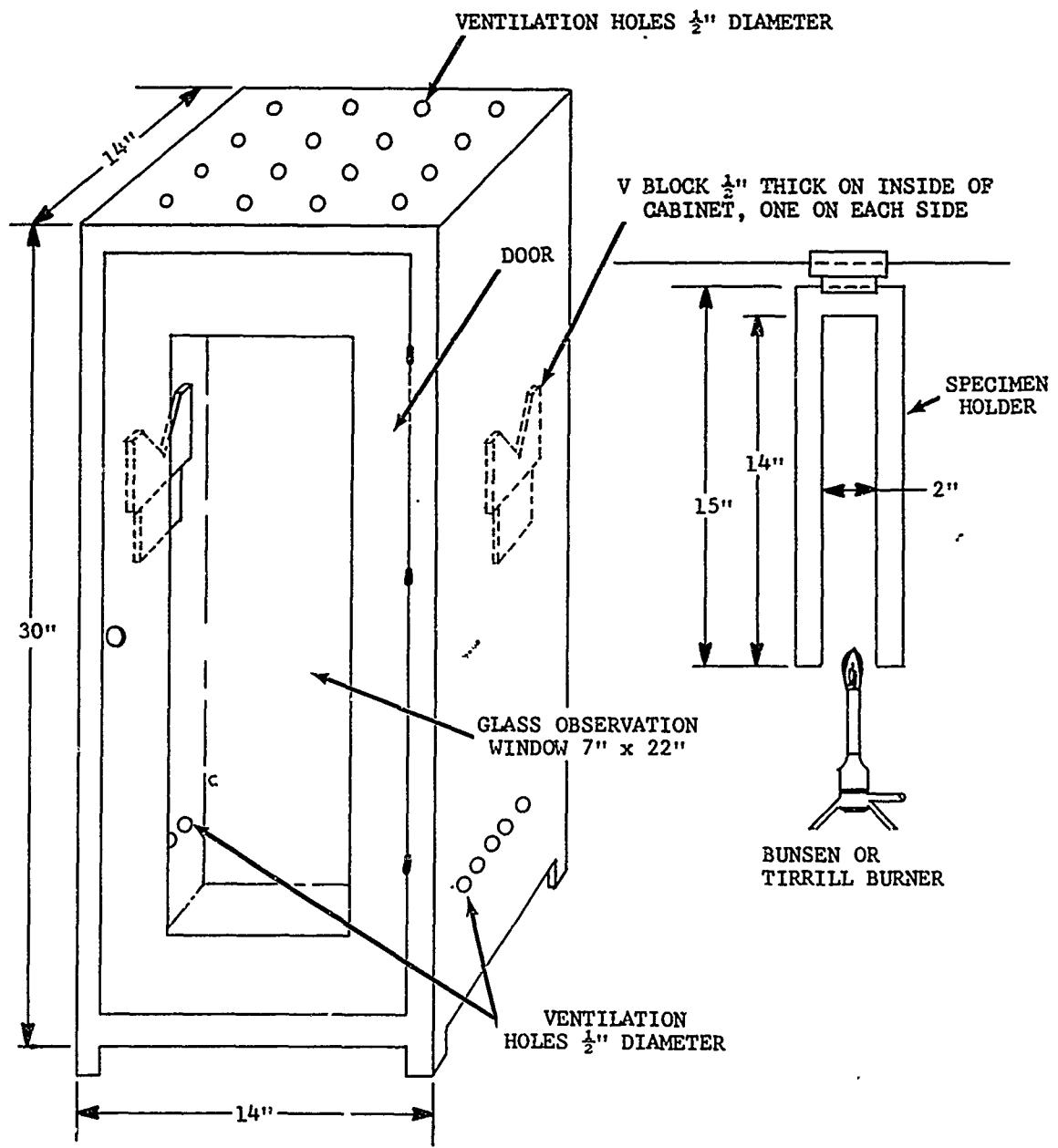


FIG. 2 VERTICAL RATE OF BURNING APPARATUS

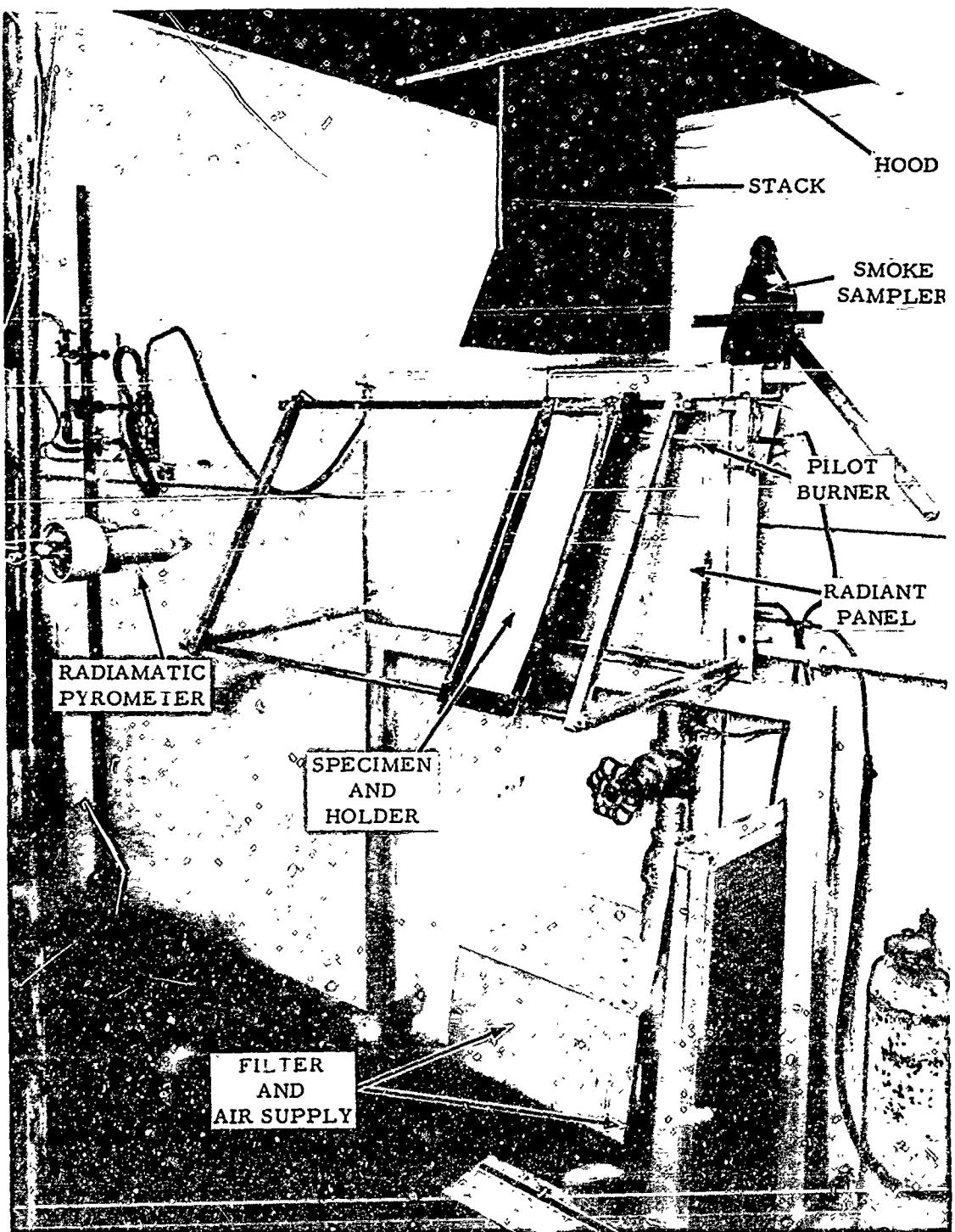
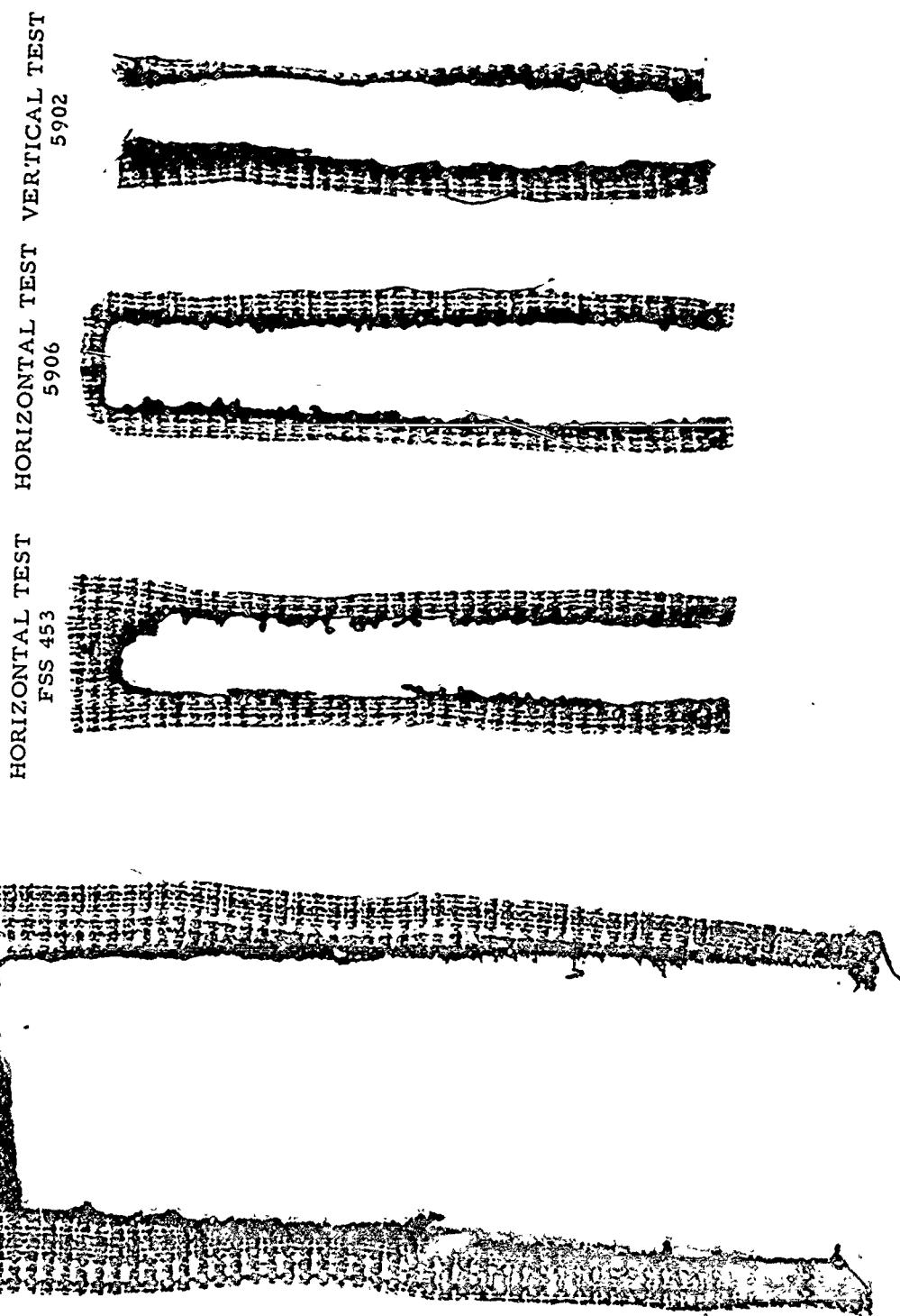


FIG. 3 RADIANT PANEL FLAME-SPREAD APPARATUS (ASSEMBLY)

RADIANT PANEL
TEST



F - 4 HIGH FLAMMABLE MATERIAL

RADIANT PANEL
TEST

HORIZONTAL TEST HORIZONTAL TEST VERTICAL TEST
FSS 453 5906 5902

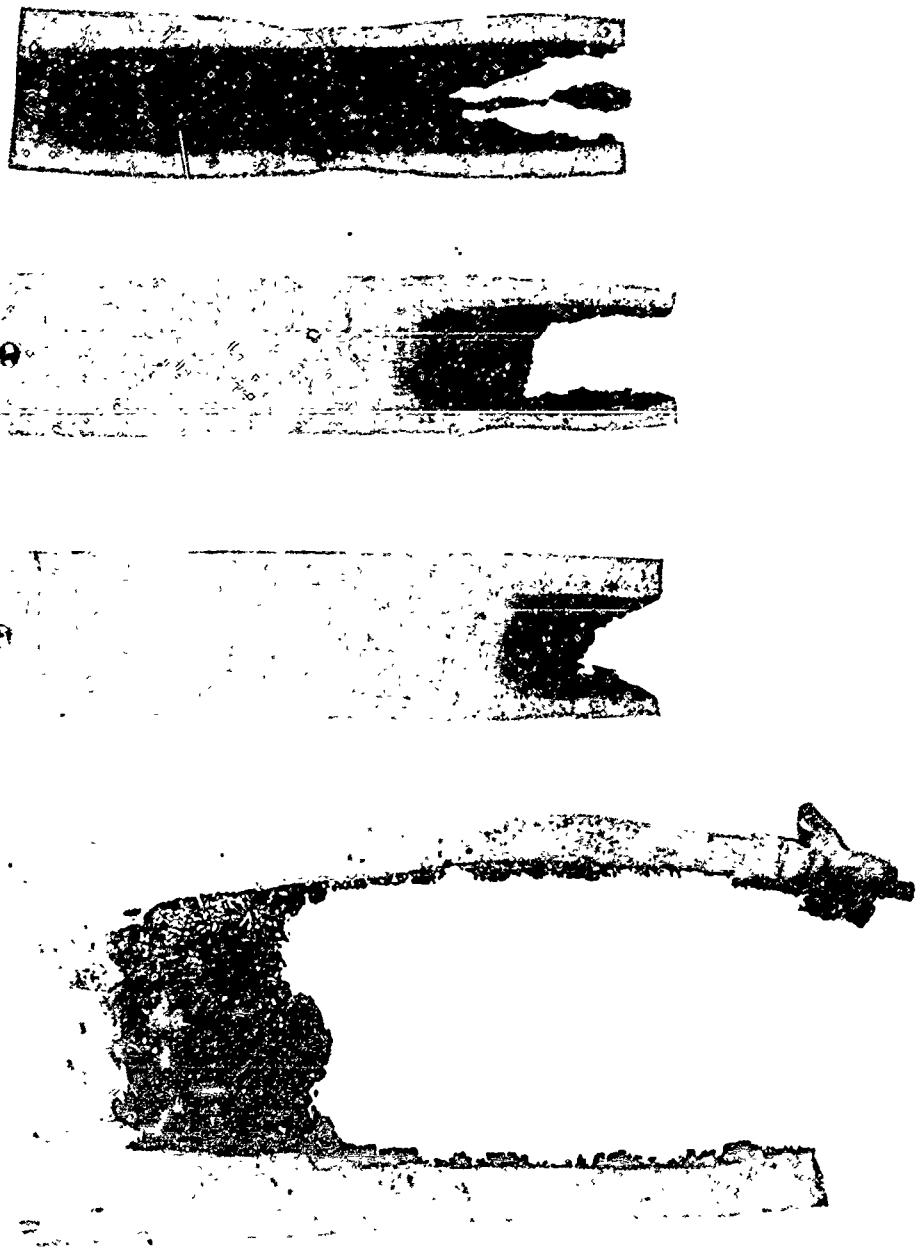


FIG. 5 LOW FLAMMABLE MATERIAL

APPENDIX 1
MATERIALS DESCRIPTION

MATERIALS DESCRIPTION

No.	Code	Sample (in.)	Thickness (in.)	Weight (lb./sq.yd.)	Designation	Use	Composition
1	R1	0.21	2.44	Rug (UP)	Flooring		Wool backed by Cotton with Neoprene base
2	F1	0.025	0.54	Fabric (UC)	Drapery	Nylon	
3	F1	0.005	0.11	Fabric (UC)	Curtain	'acron	
4	F1	0.006	0.12	Fabric (UC)	Curtain - liner	Dacron	
5	F2	0.020	1.11	Fabric (C)	Upholstery	Vinyl backed by Cotton	
6	F1	0.018	0.66	Fabric (UC)	Upholstery		
7	F1	0.031	0.66	Fabric (UC)	Upholstery		
8	F1	0.034	1.20	Fabric (UC)	Upholstery	Nylon	
9	F2	0.012	0.65	Fabric (C)	Ceiling	Vinyl backed by Dynel	
10	S1	0.010	0.66	Sheet (F)	Panel and Door covering	Vinyl	
11	S3	0.030	1.97	Sheet (R)	Bulkhead and Galley covering	Melamine backed by Phenol	
12	R1	0.30	3.6	Rug (UP)	Flooring	Acrilan backed by Furane resin	
13	F1	0.030	0.86	Fabric (UC)	holstery	Nylon, Cotton, Viscose and Metal	

MATERIALS DESCRIPTION (Continued)

<u>No.</u>	<u>Code</u>	<u>Sample Thickness (in.)</u>	<u>Weight (lb./sq.yd.)</u>	<u>Designation</u>	<u>Use</u>	<u>Composition</u>
14	F1	0.020	0.63	Fabric (UC)	Drapery in Coat Compartment	Nylon and Metal
15	F1	0.027	0.60	Fabric (UC)	Upholstery	Nylon
16	F1	0.025	0.63	Fabric (UC)	Upholstery	Nylon
17	F1	0.026	0.73	Fabric (UC)	Upholstery	Nylon, Cotton and Metal
18	F1	0.030	0.73	Fabric (UC)	Upholstery	Nylon
19	F1	0.020	0.57	Fabric (UC)	Curtain - window	Nylon
20	F1	0.020	0.60	Fabric (UC)	Drapery - coat and gallery	Nylon
21	F2	0.015	0.73	Fabric (C)	Ceiling - lavatory	Vinyl backed by Cotton
22	F2	0.008	0.60	Fabric (C)	Lining - wall	Vinyl backed by Fiberglas
23	F2	0.022	1.01	Fabric (C)	Upholstery - seat and arm rest	Vinyl backed by Cotton

MATERIALS DESCRIPTION (Continued)

<u>No.</u>	<u>Code</u>	<u>Sample Thickness (in.)</u>	<u>Weight (lb./sq.yd.)</u>	<u>Designation</u>	<u>Use</u>	<u>Composition</u>
24	F2	0.017	1.01	Fabric (C)	Lining - wall and ceiling	Vinyl backed by Cotton
25	L1	0.30	5.48	Laminate (F)	Flooring - under seats	Vinyl backed by Fiberglass on Foam pad (1/4")
26	R1	0.21	3.22	Rug (UP)	Flooring	Wool
27	R2	0.36	3.82	Rug (P)	Flooring	Wool backed by Foam pad (3/16")
28	F2	0.012	0.66	Fabric (C)		Vinyl backed by Fiberglass
29	L1	0.17	2.19	Laminate (F)		Vinyl backed by Fiberglass on Foam pad (1/8")
30	S3	0.19	11.7	Sheet (R)	Window frames, Food tray, etc.	Vinyl (3/16")
31	S3	0.09	5.50	Sheet (R)		Vinyl (3/32")
32	S3	0.063	3.58	Sheet (R)		Vinyl (1/16")
33	S3	0.057	3.55	Sheet (R)		Vinyl (1/16")

MATERIALS DESCRIPTION (Continued)

No.	Code	Sample Thickness (in.)	Weight (lb./sq.yd.)	Designation	Use	Composition
34	S3	0.043	2.63	Sheet (R)		Vinyl (3/64")
35	S2	0.021	1.09	Sheet (SR)	Paneling	Resin-filled Cotton
36	F2	0.020	1.20	Fabric (C)	Paneling	Vinyl backed by Nylon - both sides coated
37	F2	0.060	1.93	Fabric (C)	Upholstery	Vinyl backed by Cotton
38	F2	0.045	1.09	Fabric (C)	Upholstery	Vinyl backed by Cotton
39	L2	0.036	2.73	Laminate (SR)	Lining - cargo compartment	Vinyl backed by Fiberglas - Polyester filler
40	F2	0.025	0.98	Fabric (C)		Vinyl backed by Cotton
41	R1	0.24	3.39	Rug (UP)	Flooring	Nylon, Dacron
42	F1	0.040	0.98	Fabric (UC)	Upholstery	Nylon, Viscose
43	F1	0.030	0.86	Fabric (UC)	Curtain	Cotton, Mohair, Viscose, Metal
44	F1	0.025	0.73	Fabric (UC)		Nylon, Viscose, Metal

MATERIALS DESCRIPTION (Continued)

No.	Code	Sample Thickness (in.)	Weight (lb./sq.yd.)	Designation	Use	Composition
45	F1	0.060	0.79	Fabric (UC)	Upholstery	Nylon, Cotton, Dacron
46	F2	0.034	1.65	Fabric (C)	Upholstery - seat	Vinyl backed by Cotton
47	S1	0.011	0.73	Sheet (F)	Covering - aluminum panel	Vinyl
48	F2	0.020	1.52	Fabric (C)	Covering - wall	Vinyl backed by Cotton
49	F2	0.020	1.49	Fabric (C)	Covering - wall	Vinyl backed by Cotton
50	F2	0.033	1.30	Fabric (C)	Covering - wall	Vinyl backed by Cotton
51	F2	0.010	0.63	Fabric (C)	Headlining, Ceiling and Entrance lining	Vinyl backed by Fiberglas
52	F2	0.013	0.89	Fabric (C)	Lining - entrance	Vinyl backed by Fiberglas
53	F2	0.017	3.20	Fabric (C)	Lining - entrance and door	Vinyl backed by Fiberglas
54	F2	0.022	1.20	Fabric (C)	Wainscoting, Partition and Seat panels	Vinyl backed by Fiberglas

MATERIALS DESCRIPTION (Continued)

No.	Code	Sample Thickness (in.)	Weight (lb./sq.yd.)	Designation	Use	Composition
55	F2	0.029	1.80	Fabric (C)	Covering - table top	Vinyl backed by Fiberglas
56	F2	0.010	0.57	Fabric (C)	Headlining, Covering - hatrack (side- wall)	Vinyl backed by Fiberglas
57	L1	0.011	0.67	Laminate (F)	Ceiling, Partition panel	Vinyl, Fiberglas backed by Mylar
58	L2	0.017	1.02	Laminate (SR)	Ceiling, Seat panel	Mylar backed by Fiberglas
59	L2	0.015	0.91	Laminate (SR)	Ceiling, Seat panel	Mylar backed by Fiberglas
60	F2	0.017	1.05	Fabric (C)	Covering - door and partition	Vinyl backed by Fiberglas
61	F2	0.009	0.44	Fabric (C)	Lining - hatrack	Vinyl backed by Dynel
62	F2	0.016	0.63	Fabric (C)	Covering - ceiling panel	Vinyl backed by Dynel
63	F2	0.011	0.51	Fabric (C)	Covering - ceiling panel	Vinyl backed by Dynel

MATERIALS DESCRIPTION (Continued)

<u>No.</u>	<u>Code</u>	<u>Sample (in.)</u>	<u>Thickness (in.)</u>	<u>Weight (lb./sq.yd.)</u>	<u>Designation</u>	<u>Use</u>	<u>Composition:</u>
64	F2	0.005	0.28	Fabric (C)	Covering - insulation blanket	Vinyl backed by Nylon	
65	F2	0.031	1.74	Fabric (C)	Flooring - cover	Vinyl backed by Fiberglas	
66	S1	0.13	0.76	Sheet (F)	Flooring - underlay	Vinyl sponge (1/8") - closed cell	
67	F3	0.045	1.52	Leather	Upholstery - lounge	Leather - top grain	
68	S1	0.183	0.57	Sheet (F)	Flooring - underlay	Polyurethane Foam	
69	S2	0.114	7.89	Sheet (SR)	Flooring - entry mat	Rubber - synthetic	
70	F1	0.032	0.60	Fabric (UC)	Drapery	Acrylic Resin, Metal	
71	A	2.50	11.76	Assembly	Ceiling panel - with blanket	Vinyl backed by Fiberglas fabric (one) with Fiberglas core (2 1/2") - Lead sheet in Fiberglas	
72	A	0.50	5.17	Assembly	Window Panel	Vinyl clad aluminum (one) with Fiberglas pad (1/2")	

MATERIALS DESCRIPTION (Continued)

<u>No.</u>	<u>Code</u>	<u>Sample Thickness (in.)</u>	<u>Weight (lb./sq.yd.)</u>	<u>Designation</u>	<u>Use</u>	<u>Composition</u>
73	A	0.75	6.40	Assembly	Hatrack - underside	Vinyl backed by Fiberglas Fabric over Polyurethane sheet (3/8") cemented to Styrofoam sheet (1/4") by Polyester glass fabric
74	A	0.047	4.74	Assembly	Window panel	Plastic clad aluminum
75	A	0.50	4.59	Assembly	DADO Panel	Plastic clad aluminum sheet backed by Fiberglas pad (1/2")
76	A	0.245	12.20	Assembly	Toilet floor pan	Vinyl reinforced Fiberglas
77	S3	NA	NA	Sheet (R)	Windowpane	Plexiglas
78	A	0.06	5.14	Assembly	Air return grille	Polyester Fiberglas
79	A	0.45	10.81	Assembly	Toilet ceiling	Vinyl backed by fabric over Polyester glass fabric bonded on wood laminate (3/8")
80	A	1.03	10.9	Assembly	Aisle and Bulk-head partitions	Formica sheet bonded on Polyester glass fabric (two) with Honeycomb paper core, (1")

MATERIALS DESCRIPTION (Continued)

No.	Code	Sample (in.)	Thickness (lb./sq.yd.)	Weight (lb./sq.yd.)	Designation	Use	Composition
81	A	1.15	10.1	Assembly	Aisle and Bulk-head partitions		Texolite sheet bonded on Polyester glass fabric (two) with Honeycomb paper core, (1")
82	A	1.04	8.24	Assembly	Aisle and Bulk-head partitions		Vinyl backed by fabric (two) cemented on Polyester glass fabric (two) with Honeycomb paper core (1")
83	A	1.05	12.1	Assembly	Aisle and Bulk-head partitions		Plastic sheet bonded on Polyester glass fabric (two) with Honeycomb paper core, (1")
4	A	0.54	6.46	Assembly	Partitions		Vinyl sheet cemented on Polyester glass fabric (two) with Honeycomb paper core, (1/2")
85	L3	0.042	4.59	Laminate (R)			Vinyl clad aluminum
86	L3	0.044	4.53	Laminate (R)	Lowered ceiling		Vinyl clad aluminum
87	L3	0.035	3.80	Laminate (R)	Closure panel		Vinyl clad aluminum
88	L3	0.040	4.25	Laminate (R)	Light cove		Mylar clad aluminum

MATERIALS DESCRIPTION (Continued)

No.	Code	Sample Thickness (in.)	Weight (lb./sq.yd.)	Designation	Use	Composition
89	F3	0.040	1.05	Leather	Upholstery - lounge	Leather - top grain
90	S1	1.19	0.71	Sheet (F)	Padding	Neoprene sponge (1")
91	S1	NA	NA	Sheet (F)	Padding	Neoprene sponge (1")
92	F2	0.028	1.11	Fabric (C)	Upholstery	Vinyl backed by Cotton
93	F2	0.026	1.65	Fabric (C)	Upholstery	Vinyl backed by Cotton
94	F2	0.026	1.65	Fabric (C)	Upholstery	Vinyl backed by Cotton
95	S1	0.012	0.48	Sheet (F)	Window shade	Vinyl plastisol film
96	S1	0.29	1.20	Sheet (F)	Padding, Insulation	Vinyl sponge (1/4")
97	S1	0.27	1.30	Sheet (F)	Padding, Insulation	Vinyl sponge (1/4")
98	S1	0.27	1.62	Sheet (F)	Padding, Insulation	Vinyl sponge (1/4")
99	R2	0.32	3.77	Rug (P)	Flooring	Wool backed by Cotton and Jute with Foam Rubber padding

MATERIALS DESCRIPTION (Continued)

<u>No.</u>	<u>Code</u>	<u>Sample Thickness (in.)</u>	<u>Weight (lb./sq.yd.)</u>	<u>Designation</u>	<u>Use</u>	<u>Composition</u>
100	R1	0.18	2.57	Rug (UP)	Flooring	Mohair backed by Cotton and Jute
101	R2	0.32	4.22	Rug (P)	Flooring	Wool backed by Cotton and Jute with Curon padding (3/16")
102	R2	0.20	2.92	Rug (P)	Flooring	Nylon backed by Dacron with Latex base
103	R2	0.46	3.48	Rug (P)	Flooring	Nylon backed by Cotton, Jute and Dacron with Curon padding (3/16")
104	R2	0.28	4.75	Rug (P)	Flooring	Nylon backed by Synthetic with Foam padding
105	R1	0.22	2.88	Rug (UP)	Flooring	Mohair backed by Cotton and Jute
106	S1	2.75	2.50	Sheet (F)	Padding - seat	Polyether Foam (2 1/2")
107	S1	0.010	0.63	Sheet (F)	Covering - laminate	Polyvinyl
108	S1	0.005	0.35	Sheet (F)	Covering - laminate	Polyvinyl
109	S1	NA	NA	Sheet (F)	Covering - laminate	Polyvinyl
<u>Code and Designation</u>						

F - Fabric
 1 - Uncoated (UC), 2 - Coated (C), 3 - Leather
 R - Rug
 1 - Unpadded (UP), 2 - Padded (P)

S - Sheet, L - Laminate, A - Assembly
 1 - Flexible (F), 2 - Semi-rigid (SR), 3 - Rigid (R)
 FR - designates flame-retardant treatment. List includes:
 Nos. 30, 31, 33, 42, 44, 46, 70, 92, 93, 94 and 109.

APPENDIX 2

FLAMMABILITY TEST DATA ON INTERIOR MATERIALS

LIST OF TABLES (APPENDIX 2)

Table

I Test Method 5906 - Horizontal

 Part 1 - General Tests - Representative Materials

 Part 2 - Special Tests - New, Used and Cleaned Materials

II Test Method FSS Release 453

 General Tests - Representative Materials

III Test Method 5902 - Vertical

 Part 1 - General Tests - Representative Materials

 Part 2 - Special Tests - New, Used and Cleaned Materials

IV Test Method NBS Radiant Panel

 Part 1 - General Tests - Representative Materials

 Part 2 - Special Tests - New, Used and Cleaned Materials

TABLE I
TEST METHOD 5906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length		Burn Rate (Measured From Start Wire) (in./min.)	Initial Burn Rate (in./min.)	Final Burn Rate (1.5 in. / 10 in.)	Remarks
			(in.)	Start Wire)				
1 R1	0.10	2.00	0.0		1			
1	0.10	2.00	0.0		1			
Avg.	0.10	2.00	0.0		1			
2 F1	0.25	3.40	8.4		2.7	12.5	II	
3 F1	0.00	0.00	0.0		1			
3	0.10	2.30	0.0		1			
Avg.	0.05	1.20	0.0		1			
4 F1	0.03	0.42	0.0		1			
4	0.17	0.35	0.0		1			
Avg.	0.10	0.39	0.0		1			
5 F2	0.10	0.92	0.2		1.2	2.3	II	
5	0.12	0.70	0.0		1			
5	0.12	0.75	0.3		1.8	4.1	II	
Avg.	0.11	0.79	0.2		1.5	3.2	II	
6 F1	0.07	4.33	10.0		X			
6	0.07	3.84	10.0		X			
Avg.	0.07	4.10	10.0		X			
7 F1	0.05	4.92	10.0		X			
7	0.07	5.53	10.0		X			
Avg.	0.06	5.20	10.0		X			
8 F1	0.07	6.67	3.6		0.6	1.8	II	
8	0.07	3.22	2.4		0.6	2.9	II	
Avg.	0.07	5.00	3.0		0.6	2.4	II	
9 F2	0.05	0.50	0.0		1			
9	0.05	0.50	0.0		1			
Avg.	0.05	0.50	0.0		1			

TABLE I (Continued)
 TEST METHOD 5906 - HORIZONTAL
 Part I - General Tests - Representative Materials

Material No.	Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length Measured From Start Wire (in.)	Burn Rate		Burn Rate Initial 1.5 in. (in./min.)	Burn Rate Final 10 in. (in./min.)	Remarks
					(in./min.)	(in./min.)			
10	S1	0.05	0.33	0.0			1		
10		0.05	0.35	0.0			1		
10		0.05	0.32	0.0			1		
Avg.		0.05	0.34	0.0			1		
11	S3	0.25	2.50	0.0			1		
12	R1	0.05	13.80	10.0					
12		0.07	6.00	3.5					
Avg.		0.06	9.90	6.8			0.5	0.89	XI
13	F1	0.08	6.80	10.0					
13		0.13	6.80	10.0					
13		0.07	6.80	10.0					
13		0.07	6.70	10.0					
Avg.		0.09	6.80	10.0					
14	F1	0.10	5.30	10.0					
14		0.07	5.10	10.0					
14		0.10	5.10	10.0					
14		0.08	5.10	10.0					
Avg.		0.09	5.20	10.0					
15	F1	0.08	0.43	0.0					
15		0.07	0.57	0.0					
15		0.10	1.43	10.0					
15		0.03	0.67	0.8					
Avg.		0.07	0.78	2.7			2.7	7.4	XI
16	F1	0.08	1.29	1.2					
16		0.05	0.84	0.7					
16		0.05	0.77	0.3					
16		0.07	0.92	0.6					
Avg.		0.06	0.95	0.7			1.0	6.4	XI

TABLE I (Continued)
 TEST METHOD 5906 - HORIZONTAL
 Part 1 - General Tests - Representative Materials

Material No.	Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length (Measured From Start Wire)		(Measured From Start Wire) (in./min.)	Burn Rate Initial (in./min.)	Burn Rate Final (in./min.)	Remarks
				(in.)	(in.)				
17	F1	0.07	0.92	0.4	1.2		2.2	II	
17		0.05	9.25	10.0	X		2.8	1.2	
17		0.05	7.80	9.7		1.4	2.9	II	
17		0.08	0.67	0.2		1.2	3.6	II	
Avg.		0.06	4.70	5.1	1.3		2.9	II	
18	F1	0.10	3.25	10.0	X		6.4	3.4	Light smoke, melt, drips to bottom of cabinet and burns
18		0.05	2.62	10.0	X		5.8	4.3	
18		0.05	2.77	10.0	X		5.3	4.1	
18		0.10	3.13	10.0	X		8.2	3.5	
Avg.		0.08	2.90	10.0	X		6.4	3.8	
19	F1	0.07	2.43	7.0		3.6	3.6	II	
19		0.07	0.48	0.0	I				
19		0.05	2.20	9.5		5.1	5.3	II	
19		0.05	0.70	0.0	I				
Avg.		0.06	1.45	4.1		2.2	4.4	II	
20	F1	0.07	2.62	5.5		2.4	6.9	II	
20		0.05	2.92	10.0	X		7.5	3.7	
20		0.05	3.30	10.0	X		5.6	3.3	
20		0.03	0.40	0.0	I				
Avg.		0.05	2.30	6.4		2.3	6.7	II	
21	F2	0.05	0.25	0.0		I			
21		0.03	0.40	0.0		I			
21		0.03	0.40	0.0		I			
21		0.03	0.35	0.0		I			
Avg.		0.04	0.34	0.0		I			
22	F2	0.05	0.35	0.0		I			
22		0.05	0.37	0.0		I			
22		0.05	0.30	0.0		I			
22		0.05	0.18	0.0		I			
Avg.		0.05	0.30	0.0		I			
									Heavy smoke; acrid odor
									Heavy smoke; acrid odor

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part I - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length Measured From Start Wire (in.)	Burn Rate		Remarks
				Measured From Start Wire (in./min.)	Initial 1.5 in. Final 10 in. (in./min.)	
-23 F2	0.05	2.33	10.0	X	5.0	Heavy smoke; acrid odor
23	0.05	2.43	10.0	X	6.0	
23	0.05	2.47	10.0	X	5.0	
Avg.	0.05	2.60	10.0	X	5.3	
24 F2	0.07	0.50	0.0	I		
24	0.05	0.43	0.0	I		
24	0.08	0.53	0.0	I		
24	0.07	0.57	0.0	I		
Avg.	0.07	0.51	0.0	I		
25 L1	0.12	1.75	0.0	I		
25	0.05	2.17	0.0	I		
25	0.05	2.15	0.0	I		
25	0.05	1.75	0.0	I		
Avg.	0.07	2.00	0.0	I		
26 R1	0.10	2.00	0.0	I		
26	0.10	2.00	0.0	I		
26	0.12	1.67	0.0	I		
26	0.12	1.70	0.0	I		
Avg.	0.11	1.8	0.0	I		
27 R2	0.13	14.89	4.0	0.3	0.57	II
27	0.10	15.00	6.5	0.5	1.20	II
27	0.13	5.00	1.4	0.4	1.40	II
27	0.12	5.00	1.4	0.4	1.60	II
Avg.	0.12	--	3.3	0.4	1.19	II
28 P2	0.05	0.50	0.0	I		
28	0.05	0.50	0.0	I		
28	0.03	0.33	0.0	I		
28	0.03	0.30	0.0	I		
Avg.	0.04	0.41	0.0	I		

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length (Measured From Start Wire) (in.)	Burn Rate			Burn Rate Initial 1.5 in. (in./min.)	Burn Rate Final 10 in. (in./min.)	Remarks
				Measured From Start Wire)	(in./min.)	1.5 in. (in./min.)			
29 L1	0.07	0.75	0.0			1			Heavy smoke
29	0.10	1.27	0.0			1			
29	0.07	0.50	0.0			1			
29	0.05	0.45	0.0			1			
Avg.	0.07	0.74	0.0			1			
30 S3	0.13	5.00	0.0			1			Heavy, sooty smoke
30	0.10	2.00	0.0			1			
30	0.13	2.00	0.0			1			
30	0.12	2.00	0.0			1			
Avg.	0.12	2.80	0.0			1			
31 S3	0.20	4.00	0.0			1			Moderate to heavy smoke
31	0.13	4.00	0.0			1			
31	0.16	2.00	0.0			1			
31	0.15	2.00	0.0			1			
Avg.	0.16	3.00	0.0			1			
32 S3	0.47	2.33	0.0			1			Very heavy smoke
32	0.42	2.00	0.0			1			
32	0.28	2.00	0.0			1			
32	0.22	2.00	0.0			1			
Avg.	0.35	2.10	0.0			1			
33 S3	0.47	2.05	0.0			1			Very heavy black smoke; burning stopped at 1.5 inches
33	0.13	2.00	0.0			1			
33	0.20	2.00	0.0			1			
33	0.15	1.75	0.5			0.5			
Avg.	0.24	2.00	0.3			0.5			
34 S3	0.30	3.00	0.0			1			
34	0.08	1.75	0.0			1			
34	0.05	2.00	0.0			1			
34	0.07	2.00	0.0			1			
Avg.	0.13	2.20	0.0			1			

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length (Measured From Start Wire) (in.)	Burn Rate		Remarks
				Measured From Start Wire (in.)	Initial 1.5 in. (in./min.)	
35 S2	0.13	0.59	0.0			
35	0.15	0.75	0.0			
35	0.13	1.42	0.0			
35	0.05	0.85	0.0			
Avg.	0.12	0.90	0.0			
36 F2	0.07	1.33	0.0			
37 F2	0.05	3.48	10.0	X	2.1	3.7
37	0.05	3.69	10.0	X	2.4	3.3
Avg.	0.06	3.58	10.0	X	2.3	3.5
38 F2	0.05	2.37	10.0	X	3.5	5.3
38	0.05	2.50	10.0	X	3.6	4.9
Avg.	0.05	2.40	10.0	X	3.5	5.1
40 F2	0.05	1.87	10.0	X	6.0	6.4
40	0.05	1.59	10.0	X	6.4	7.7
40	0.03	1.69	10.0	X	5.6	7.1
40	0.05	1.62	10.0	X	7.5	7.3
Avg.	0.05	1.70	10.0	X	6.4	7.1
41 R1	0.15	5.92	2.6	0.5	1.4	II
41	0.17	7.35	10.0	X	1.4	1.6
41	0.13	7.47	10.0	X	1.5	1.5
41	0.13	1.75	0.3	0.5	1.4	II
Avg.	0.15	5.60	5.7	1.0	1.4	II
42 F1	0.08	2.08	0.0	I		
42	0.08	0.84	0.0	I		
42	0.10	1.03	0.0	I		
42	0.10	1.08	0.0	I		
Avg.	0.09	1.00	0.0	I		

TABLE I (Continued)
 TEST METHOD 5906 - HORIZONTAL
 Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burning Time (min.)</u>	<u>Burn Length (Measured From Start Wire) (in.)</u>	<u>Burn Rate (Measured From Start Wire) (in./min.)</u>	<u>Initial 1.5 in. Burn Rate (in./min.)</u>	<u>Final 10 in. Burn Rate (in./min.)</u>	<u>Remarks</u>
43	F1	0.07	3.84	10.0	X	3.9	3.0	Moderate gray smoke
43		0.12	3.92	10.0	X	4.6	2.9	
43		0.10	3.67	10.0	X	4.6	3.1	
43		0.12	3.89	10.0	X	4.1	3.0	
<u>Avg.</u>		<u>0.10</u>	<u>3.80</u>	<u>10.0</u>	<u>X</u>	<u>4.3</u>	<u>3.0</u>	
44	F1	0.05	0.52	0.0	I			
44		0.05	6.00	10.0	X			
44		0.10	0.84	0.0	I			
44		0.07	0.92	0.0	I			
<u>Avg.</u>		<u>0.07</u>	<u>2.10</u>	<u>2.5</u>	<u>0.5</u>	<u>2.4</u>	<u>1.9</u>	Heavy black smoke
45	F1	0.10	5.20	10.0	X	6.0	2.1	
45		0.05	5.27	10.0	X	3.5	2.1	
45		0.05	5.28	10.0	X	3.6	2.1	
45		0.05	5.32	10.0	X	3.5	2.1	
<u>Avg.</u>		<u>0.06</u>	<u>5.30</u>	<u>10.0</u>	<u>X</u>	<u>4.1</u>	<u>2.1</u>	Moderate smoke
46	F2	0.10	0.84	0.0	I			
46		0.05	0.92	0.0	I			
46		0.07	0.90	0.0	I			
46		0.07	0.89	0.0	I			
<u>Avg.</u>		<u>0.07</u>	<u>0.89</u>	<u>0.0</u>	<u>I</u>			
47	S1	0.03	0.37	0.0	I	5.0		
47		0.03	0.55	0.0	I	8.8		
47		0.03	0.57	0.5	I	12.5	II	
47		0.03	0.57	0.0	I	7.5	II	
<u>Avg.</u>		<u>0.03</u>	<u>0.52</u>	<u>0.1</u>	<u>0.3</u>	<u>8.7</u>	<u>II</u>	Burning stopped at 1.5 inches
48	F2	0.05	0.80	0.0	I			
48		0.05	0.87	0.0	I			
48		0.05	0.92	0.0	I			
48		0.05	0.89	0.0	I			
<u>Avg.</u>		<u>0.05</u>	<u>0.87</u>	<u>0.0</u>	<u>I</u>			Burning stopped at 1.5 inches

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignit' n Time (min.)</u>	<u>Burning Time (min.)</u>	<u>Burn Length (Measured From Start Wire) (in.)</u>	<u>Burn Rate (Measured From Start Wire) (in./min.)</u>	<u>Burn Rate Initial 1.5 in. (in./min.)</u>	<u>Burn Rate Final 10 in. (in./min.)</u>	<u>Remarks</u>
49	F2	0.05	1.30	1.6	2.2	3.5	III	Heavy smoke
49		0.07	2.64	6.3	2.5	3.6	II	
49		0.07	1.22	1.5	2.0	3.7	II	
49		0.05	3.07	8.4	3.2	3.4	II	
Avg.		0.06	2.10	4.5	2.6	3.5	II	
50	F2	0.05	2.50	3.4	1.7	3.7	II	Heavy gray smoke; acrid odor
50		0.05	3.22	10.4	X	4.7	3.5	
50		0.05	3.94	7.8	2.2	4.7	II	
50		0.05	2.30	3.5	1.8	4.7	II	
Avg.		0.05	3.0	6.2	2.3	4.5	II	
51	F2	0.05	0.28	0.0	1			Light gray smoke
51		0.05	0.30	0.0	1			
51		0.05	0.32	0.0	1			
51		0.05	0.23	0.0	1			
Avg.		0.05	0.28	0.0	1			
52	F2	0.05	0.38	0.0	1			Moderate to heavy smoke
52		0.05	0.38	0.0	1			
52		0.05	0.32	0.0	1			
52		0.05	0.37	0.0	1			
Avg.		0.05	0.36	0.0	1			
53	F2	0.03	0.75	0.0	1			Moderate gray smoke
53		0.03	0.77	0.0	1			
53		0.03	0.80	0.0	1			
Avg.		0.03	0.77	0.0	1			
54	F2	0.05	0.80	0.0	1			Moderate gray smoke
54		0.03	0.67	0.0	1			
54		0.03	0.84	0.0	1			
54		0.05	0.50	0.0	1			
Avg.		0.04	0.70	0.0	1			

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

Material No.	Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length Measured From Start Wire (in.)	Burn Rate		Remarks
					(Measured From Start Wire) (in./min.)	(Initial 1.5 in. Final 10 in.) (in./min.)	
55	F2	0.05	1.75	0.0	—	—	
55		0.05	1.84	0.0	—	—	
55		0.05	1.00	0.0	—	—	
55		0.05	0.92	0.0	—	—	
Avg.		0.05	1.40	0.0	—	—	
56	F2	0.03	0.33	0.0	—	—	
56		0.02	0.28	0.0	—	—	
56		0.02	0.32	0.0	—	—	
56		0.02	0.27	0.0	—	—	
Avg.		0.02	0.30	0.0	—	—	
57	L1	0.03	0.33	0.0	—	—	
57		0.03	0.35	0.0	—	—	
57		0.03	0.33	0.0	—	—	
57		0.03	0.30	0.0	—	—	
Avg.		0.03	0.33	0.0	—	—	
58	L2	0.02	0.42	0.0	—	—	
58		0.03	0.42	0.0	—	—	
58		0.03	0.43	0.0	—	—	
58		0.03	0.45	0.0	—	—	
Avg.		0.03	0.43	0.0	—	—	
59	L2	0.03	0.59	0.0	—	—	
59		0.03	0.62	0.0	—	—	
59		0.03	0.65	0.0	—	—	
59		0.03	0.69	0.0	—	—	
Avg.		0.03	0.64	0.0	—	—	
60	F2	0.03	0.75	0.0	—	—	
60		0.03	0.59	0.0	—	—	
60		0.05	0.75	0.0	—	—	
60		0.03	0.79	0.0	—	—	
Avg.		0.04	0.72	0.0	—	—	

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part I - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length (in.)	Burn Rate		Initial 1.5 in. (in./min.)	Final 10 in. (in./min.)	Remarks
				Measured From Start Wire	(in./min.)			
61 F2	0.03	0.17	0.0			1		No smoke
61	0.03	0.35	0.0			1		
61	0.02	0.32	0.0			1		
61	0.03	0.33	0.0			1		
Avg.	0.03	0.27	0.0			1		
62 F2	0.03	0.33	0.0			1		No smoke; melts
62	0.03	0.18	0.0			1		
62	0.03	0.33	0.0			1		
Avg.	0.03	0.28	0.0			1		
63 F2	0.02	0.07	0.0			1		Melts
63	0.03	0.23	0.0			1		
63	0.03	0.28	0.0			1		
63	0.03	0.53	0.0			1		
Avg.	0.03	0.28	0.0			1		
64 F2	0.02	0.57	1.0			2.5	10.0	
64	0.02	0.48	0.9			2.7	11.5	
64	0.03	0.62	0.7			1.6	10.7	
64	0.03	0.40	0.7			2.8	12.5	
Avg.	0.03	0.52	0.8			2.4	10.7	
65 F2	0.05	1.00	0.0			1		Moderate gray smoke
65	0.07	1.08	0.0			1		
65	0.07	1.08	0.0			1		
65	0.07	1.33	0.0			1		
Avg.	0.07	1.10	0.0			1		
66 G1	0.02	0.50	0.0			1		
66	0.02	0.40	0.0			1		
66	0.02	0.47	0.0			1		
66	0.02	0.42	0.0			1		
Avg.	0.02	0.45	0.0			1		
66								Brownish smoke; acrid odor

TABLE I (Continued)
TEST METHOD S906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

Material No. <u>Code</u>	Ignition Time (min.)	Flaming Time (min.)	Burn Length (Measured From Start Wire) (in.)	Burn Rate		Initial 1.5 in. (in./min.)	Final 10 in. (in./min.)	Remarks
				(in./min.)	(in./min.)			
67 P3	0.33	7.92	6.8	1.0	1.4	II	Moderate light gray smoke; very foul odor	
67	0.17	1.05	0.0	1				
67	0.17	1.45	0.0	1	1.4	II	Burning stopped at 1.5 inches	
67	0.12	2.17	0.3	0.3	1.6	II		
Avg.	0.20	3.15	1.8	0.3	1.4	II		
68 S1	0.03	0.75	0.0	1				
68	0.05	0.62	0.0	1				
68	0.05	0.60	0.0	1				
68	0.07	0.64	0.0	1				
Avg.	0.05	0.65	0.0	1				
69 S2	0.00	0.00	0.0	1				
69	0.00	0.00	0.0	1				
69	0.00	0.00	0.0	1				
69	0.00	0.00	0.0	1				
Avg.	0.00	0.00	0.0	1				
70 P1	0.05	0.33	0.0	1				
70	0.05	0.33	0.0	1				
70	0.03	0.32	0.0	1				
70	0.05	0.25	0.0	1				
Avg.	0.05	0.30	0.0	1				
76 A	0.07	5.00	0.0	1				
76	0.08	5.00	0.0	1				
Avg.	0.08	5.00	0.0	1				
77 S3	0.17	2.75	1.9	1.3	1.4	II	Moderate heavy smoke; acrid odor	
77	0.20	4.62	2.7	1.1	0.8	II		
Avg.	0.19	--	2.3	1.2	1.1	II		
80 A	0.13	1.50	0.0	1				

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burning Time (min.)</u>	<u>Burn Length (Measured From Start Wire) (in.)</u>	<u>Burn Rate (Measured From Start Wire) (in./min.)</u>	<u>Burn Rate Initial 1.5 in. Final 10 in. (in./min.) (in./min.)</u>	<u>Remarks</u>
81	A	0.33	2.00	0.0			
82	A	1.03	2.50	0.0			
83	A	0.10	2.30	0.0			
84	A	0.12	1.17	0.0			Light gray smoke
85	L3	0.00	0.00	0.0			
86	L3	0.00	0.00	0.0			
87	L3	0.00	0.00	0.0			
88	L3	0.00	0.00	0.0			
89	P3	0.07	1.92	0.8			
89		0.07	0.92	0.0			
Av.		0.07	1.40	0.4			
91	81	0.02	2.23	10.0	X	4.7	5.2
92	P2	0.05	0.75	0.0			
92		0.05	0.75	0.0			
92		0.07	0.70	0.0			
Av.		0.05	0.64	0.0			
		0.05	0.71	0.0			
							Very heavy smoke; acrid odor
							Heavy smoke; acrid odor

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Flaming Time (min.)</u>	<u>Burn Length (Measured From Start Wire) (in.)</u>	<u>Burn Rate (Measured Frc. Start Wire) (in./min.)</u>	<u>Burn Rate Initial Final 1.5 in. 10 in. (in./min.) (in./min.)</u>	<u>Remarks</u>
93	F2	0.07	1.03	0.0	1	1	Very heavy gray smoke
93		0.05	1.08	0.0	1	1	
93		0.05	0.92	0.0	1	1	
93		0.07	0.95	0.0	1	1	
<u>Avg.</u>		<u>0.06</u>	<u>1.00</u>	<u>0.0</u>	<u>1</u>	<u>1</u>	
94	F2	0.05	1.20	0.0	1	1	Heavy gray smoke; acrid odor
94		0.07	1.22	0.0	1	1	
94		0.07	1.30	0.0	1	1	
94		0.07	1.08	0.0	1	1	
<u>Avg.</u>		<u>0.07</u>	<u>1.20</u>	<u>0.0</u>	<u>1</u>	<u>1</u>	
95	S1	0.02	0.23	0.0	1	1	Very acrid odor
95		0.03	0.27	0.0	1	1	
<u>Avg.</u>		<u>0.03</u>	<u>0.25</u>	<u>0.0</u>	<u>1</u>	<u>1</u>	
96	S1	0.02	0.84	0.0	1	1	
96		0.02	0.59	0.0	1	1	
96		0.02	0.75	0.0	1	1	
96		0.02	0.59	0.0	1	1	
<u>Avg.</u>		<u>0.02</u>	<u>0.69</u>	<u>0.0</u>	<u>1</u>	<u>1</u>	
97	S1	0.02	0.87	0.0	1	1	
97		0.02	0.75	0.0	1	1	
97		0.02	0.72	0.0	1	1	
97		0.02	0.75	0.0	1	1	
<u>Avg.</u>		<u>0.02</u>	<u>0.77</u>	<u>0.0</u>	<u>1</u>	<u>1</u>	
98	S1	0.02	0.62	0.0	1	1	
98		0.02	0.59	0.0	1	1	
98		0.02	0.84	0.0	1	1	
98		0.02	0.85	0.0	1	1	
<u>Avg.</u>		<u>0.02</u>	<u>0.73</u>	<u>0.0</u>	<u>1</u>	<u>1</u>	

Part 1 - General Tests - Representative Materials

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Material No. <u>Ccde</u>	Ignition Time (min.)	Flaming Time (min.)	Burn Length		Burn Rate (Measured From Start Wire) (in.)	Burn Rate (Measured From Start Wire) (in./sec.)	Initial 1.5 in. (in./min.)	Final 10 in. (in./min.)	Remarks
			Start	Wire					
99 R2	0.07	3.25	0.5		0.3	0.9	II		
99	0.07	2.92	0.0		1				
Avg.	0.07	3.09	0.3		0.2	0.9	II		
100 R1	0.07	1.50	0.0		1				
100	0.07	1.33	0.0		1				
Avg.	0.07	1.42	0.0		1				
107 S1	0.03	0.59	0.0		1				
108 S1	0.03	0.13	0.0		1				
									Heavy smoke; acrid odor
									Heavy, sooty smoke; acrid odor

TABLE I
TEST METHOD 5906 - HORIZONTAL

Part 2 - Special Tests - New, Used and Cleaned Materials

Material No. Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length Measured From Start Wire (in.)	Burn Rate		Remarks
				(in./min.)	(in./min.)	
13N F1	0.07	7.12	10.0	X	3.3	Light smoke
13N	0.07	6.75	10.0	X	2.9	1.6
Avg.	0.07	6.93	10.0	X	3.1	1.5
13NC F1	0.05	6.72	10.0	X	2.3	Light smoke
13NC	0.05	6.59	10.0	X	2.4	1.7
Avg.	0.05	6.65	10.0	X	2.3	1.7
13U F1	0.07	6.25	10.0	X	3.1	Light smoke
13U	0.07	7.03	10.0	X	3.0	1.5
Avg.	0.07	6.64	10.0	X	3.1	1.6
13UC F1	0.07	6.92	10.0	X	3.3	Light smoke
13UC	0.07	7.20	10.0	X	3.1	1.5
Avg.	0.07	7.06	10.0	X	3.2	1.5
18N F1	0.07	2.18	10.0	X	5.8	5.4
18N	0.05	2.17	10.0	X	5.4	5.4
Avg.	0.06	2.18	10.0	X	5.6	5.4
18NC F1	0.07	2.07	10.0	X	7.1	5.7
18NC	0.07	2.03	10.0	X	7.1	5.7
Avg.	0.07	2.05	10.0	X	7.1	5.7
18U F1	0.07	2.05	10.0	X	7.1	5.6
18U	0.07	2.37	10.0	X	3.9	5.2
Avg.	0.07	2.21	10.0	X	5.5	5.4
18UC F1	0.05	1.72	10.0	X	6.5	6.9
18UC	0.05	1.99	10.0	X	6.8	5.8
Avg.	0.05	1.85	10.0	X	6.6	6.3

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 2 - Special Tests - New, Used and Cleaned Materials

Material No. Code	Ignition Time (min.)	Flaming Time (min.)	Burn Length		Burn Rate (Measured From Start Wire) (in.)	Initial 1.5 in. (in./min.)	Final 10 in. (in./min.)	Burn Rate (in./min.)	Remarks
			From Start Wire	To End					
19N P1	0.07	0.20	0.0	10.0	X	6.8	3.8		
19N	0.07	0.13	0.0	10.0	X	5.4	3.5		
Avg.	0.07	0.17	0.0	10.0	X	6.1	3.6		
19NC P1	0.07	2.89	10.0						Light smoke; melts, drips to bottom of cabinet and burns
19NC	0.07	3.1	10.0						
Avg.	0.07	3.1	10.0						
19U P1	0.05	0.32	0.0	1					
19U	0.05	2.22	10.0						
Avg.	0.05	1.27	5.0						
19UC P1	0.05	2.46	10.0						
19UC	0.05	2.08	10.0						
Avg.	0.05	2.28	10.0						
20N P1	0.07	2.77	10.0						
20N	0.05	3.25	10.0						
Avg.	0.06	3.01	10.0						
20NC P1	0.05	3.08	10.0						
20NC	0.07	1.43	10.0						
Avg.	0.06	3.25	10.0						
20U P1	0.05	0.42	0.0	1					
20U	0.05	0.25	0.0	1					
Avg.	0.05	0.34	0.0	1					
20UC P1	0.05	0.59	0.2						
20UC	0.05	2.38	6.5						
Avg.	0.05	1.92	3.4						

TABLE I (Continued)
TEST METHOD 5906 - HORIZONTAL

Part 2 - Special Tests - New, Used and Cleaned Materials

Material No. Code	Ignition Time (min.)	Flame Measured (min.)	Burn Length		Burn Rate (Measured From Start Wire) (in.)	Initial Burn Rate (in./min.)	Final Burn Rate (1.5 in. (in./min.) (10 ft. 10 in. (in./min.)	Remarks
			Start Wire	Wire				
27NC R2	0.07	4.00	0.0	0.0	1	0.7	II	Test stopped
27NC	0.07	4.00	0.0	0.0	1	0.7	II	Test stopped
Avg.	0.07	4.00	0.0	0.0	1	0.7	II	Test stopped
27U R2	0.07	9.00	3.5	0.5	0.2	0.7	II	Test stopped
27U	0.07	5.00	0.5	0.0	0.4	0.7	II	Note 2
Avg.	0.07	7.00	2.0	0.5	0.4	0.7	II	
27UC R2	0.08	6.00	1.0	0.3	0.3	0.6	II	Test stopped
27UC	0.08	5.00	1.0	0.4	0.4	0.6	II	
Avg.	0.08	5.50	1.0	0.4	0.4	0.6	II	
99N R2	0.07	3.25	0.5	1.1	0.5	II		
99N	0.07	2.92	0.0	1	0.6	II		
Avg.	0.07	3.08	0.3	0.6	0.3	II		
99NC R2	0.07	3.33	0.0	1	1	0.5	II	Note 3
99NC	0.07	3.33	0.0	1	1	0.5	II	
Avg.	0.07	3.33	0.0	1	1	0.5	II	
99U R2	0.08	4.25	0.0	1	1	0.5	II	
99U	0.08	4.84	0.0	1	1	0.5	II	
Avg.	0.08	4.56	0.0	1	1	0.5	II	
99UC R2	0.08	4.35	0.5	0.5	0.5	0.5	II	
99UC	0.08	6.59	1.5	0.5	0.5	0.5	II	
Avg.	0.08	5.47	1.0	0.5	0.5	0.5	II	

TABLE I (Continued)
 TEST METHOD 5906 - HORIZONTAL
 Part 2 - Special Tests - New, Used and Cleaned Materials

<u>Material</u> <u>No.</u>	<u>Ignition</u> <u>Time</u> <u>(min.)</u>	<u>Flaming</u> <u>Time</u> <u>(min.)</u>	<u>Burn Length</u> <u>(Measured From</u> <u>Start Wire)</u> <u>(in.)</u>	<u>Burn Rate</u>		<u>Remarks</u>
				<u>Initial</u> <u>1.5 in.</u> <u>(in./min.)</u>	<u>Final</u> <u>10 in.</u> <u>(in./min.)</u>	
100R R1	0.07	1.50	0.0	I	I	Note 3
100N R1	0.07	1.33	0.0	I	I	Note 3
Avg.	0.07	1.32	0.0	I	I	
100NC R1	0.08	1.50	0.0	I	I	Note 3
100NC R1	0.08	1.59	0.0	I	I	Note 3
Avg.	0.08	1.54	0.0	I	I	Note 3
100U R1	0.08	2.00	0.0	I	I	Note 3
100U R1	0.08	2.00	0.0	I	I	Note 3
Avg.	0.08	2.00	0.0	I	I	
100UC R1	0.07	2.00	0.0	I	I	Note 3
100UC R1	0.07	1.45	0.0	I	I	Note 3
Avg.	0.07	1.72	0.0	I	I	

Note 1: Letters after material no. signify: N - New; NC - New and Cleaned; U - Used; UC - Used and Cleaned.

Note 2: Test conducted with 0.042" aluminum sheet on top of pad which stopped burning.

Note 3: Material burned only in area of test flame.

I Burned less than 1.5 inches (start wire)

II Burned less than 11.5 inches (stop wire)

X Burned full length

General Tests - Representative Materials

TABLE II
TEST METHOD FSS RELEASE 453

Material No.	Code	Ignition Time (min.)	Flaming Time (Measured After 15 sec. Burner Removal) (min.)	Burn Length (Measured From Start Wire) (in.)	Burn Rate (Measured From Start Wire) (in./min.)	Initial Final 1.5 in. 10 in. Burn Rate (in./min.) (in./min.)	Remarks
13	P1	0.03	7.03	10.0	X	2.3	1.5
13		0.05	2.52	2.9	1.3	2.6	II
Avg.		0.04	4.77	6.5	1.4	2.4	II
14	P1	0.07	5.53	10.0	X	2.9	1.9
14		0.07	5.05	10.0	X	3.2	2.1
Avg.		0.07	5.29	10.0	X	3.1	2.0
15	P1	0.05	1.47	10.0	X	4.5	7.5
15		0.05	1.32	3.0	2.4	6.0	II
15		0.05	0.77	1.0	1.4	4.5	II
15		0.05	1.98	8.6	4.8	9.0	II
Avg.		0.05	1.38	5.7	4.0	6.0	II
16	P1	0.05	0.65	0.5	0.9	5.6	II
16		0.05	0.45	0.9	1		
16		0.05	0.52	0.0	1		
16		0.03	0.72	0.9	1.5	4.5	II
Avg.		0.05	0.59	0.5	0.6	5.0	II
17	P1	0.07	0.48	0.0	1		
17		0.07	0.45	0.0	1		
17		0.07	0.45	0.0	1		
17		0.07	0.48	0.0	1		
Avg.		0.07	0.47	0.0	1		
18	P1	0.08	2.59	10.0	X	4.5	4.1
18		0.13	2.63	10.0	X	4.5	4.1
18		0.08	3.02	10.0	X	4.3	3.5
18		0.07	3.28	10.0	X	4.3	3.2
Avg.		0.08	2.83	10.0	X	4.4	3.7
19	P1	0.07	0.30	0.0	0.0	9.0	II
19		0.07	2.74	10.0	X	7.0	3.7
19		0.07	2.50	4.0	2.2	1.8	II
19		0.07	2.50	3.0	1.3	4.5	II
Avg.		0.07	2.02	4.2	1.8	5.6	II

TABLE II (Continued)
TEST METHOD FSS RELEASE 453

General Tests - Representative Materials

Material No.	Code	Ignition Time (min.)	Flaming Time (Measured After 15 sec. Burner Removal)		Burn Length (Measured From Start Wire) (in.)	Burn Rate (Measured From Start Wire) (in./min.)	Initial Burn Rate 1.5 in. (in./min.)	Final Burn Rate 10 in. (in./min.)	Remarks
			Time (min.)	Time (min.)					
20	P1	0.05	3.33	10.0	X	6.9	3.0		
20	P1	0.05	0.48	0.3	1.3	3.3	II		
20	P1	0.05	0.00	0.0	1				
20	P1	0.05	2.69	6.0	2.6	2.8	II		
Avg.		0.05	1.62	4.1	1.7	4.3	II		
23	P2	0.05	2.10	10.0	X	3.2	5.1		
23	P2	0.03	2.10	10.0	X	4.7	5.0		
23	P2	0.03	2.18	10.0	X	5.0	5.1		
Avg.		0.03	2.12	10.0	X	4.3	5.0		
27	R2	0.07	1.25	0.0	I				
27	R2	0.07	2.45	0.0	I				
27	R2	0.05	1.92	0.0	I				
27	R2	0.05	2.42	0.0	I				
Avg.		0.06	2.01	0.0	I				
33	S3	0.12	0.03	0.0	I				
33	S3	0.10	0.00	0.0	I				
33	S3	0.10	0.30	0.0	I				
33	S3	0.10	0.00	0.0	I				
Avg.		0.10	0.01	0.0	I				
37	P2	0.05	3.52	10.0	X	2.0	3.4		
37	P2	0.05	3.35	10.0	X	2.0	3.5		
Avg.		0.05	3.43	10.0	X	2.0	3.5		
38	P2	0.03	2.95	10.0	X	3.0	3.7		
38	P2	0.05	2.82	10.0	X	3.1	3.9		
Avg.		0.04	2.89	10.0	X	3.1	3.8		
40	P2	0.05	1.70	10.0	X	6.9	5.9		
41	R1	0.12	1.97	0.0	I				
41	R1	0.12	2.10	0.0	I				
41	R1	0.12	2.32	0.0	I				
Avg.		0.12	2.13	0.0	I				

General Tests - Representative Materials

TABLE II (Continued)
TEST METHOD FSS RELEASE 453

Material No. Code	Ignition Time (min.)	Piloting Time (Measured After 15 sec. Burner Removal)		Burn Length (Measured From Start Wire) (in.)	Burn Rate (Measured From Start Wire) (in./min.)	Burn Rate Initial Final 1.5 in. 10 in. (in./min.) (in./min.)		Remarks
		(min.)	(min.)			1.5 in. (in./min.)	10 in. (in./min.)	
42 P1	0.07		0.59	0.0	0.0			I
42	0.10		0.55	0.0	0.0			I
42	0.12		0.43	0.0	0.0			I
42	1.10		0.59	0.0	0.0			I
Avg.	0.35		0.56	0.0	0.0			I
43 P1	0.07	4.08	10.0	X	X	3.6	2.6	
43	0.07	4.07	10.0	X	X	3.3	2.6	
43	0.07	4.20	10.0	X	X	2.6	2.6	
43	0.07	4.13	10.0	X	X	3.8	2.6	
Avg.	0.07	4.11	10.0	X	X	3.6	2.6	
44 P1	0.07	1.33	0.8	1.5	1.7	II		
44	0.07	0.33	0.0	I	I			
44	0.07	2.55	1.8	1.0	1.6	II		
Avg.	0.07	1.48	0.9	0.8	1.1	II		
45 P1	0.05	5.07	10.0	X	X	2.7	2.1	
45	0.05	5.42	10.0	X	X	2.6	2.0	
Avg.	0.05	5.24	10.0	X	X	2.7	2.1	
49 P2	0.07	0.55	0.2	0.9	3.0	II		
49	0.07	0.42	0.2	5.0	2.6	II		
Avg.	0.07	0.49	0.2	3.0	2.6	II		
50 P2	0.07	0.87	0.8	2.4	2.1	II		
50	0.07	0.13	0.0	I				
50	0.07	1.10	0.8	0.9	3.7	II		
50	0.07	1.33	1.5	1.4	3.5	II		
Avg.	0.07	0.86	0.8	1.2	3.1	II		
64 P2	0.03	0.25	1.2	2.6	11.3	II		
64	0.02	0.00	0.7	8.4	10.1	II		
64	0.02	0.00	0.0	I				
64	0.02	0.25	1.8	5.4	10.1	II		
Avg.	0.02	0.13	0.9	4.4	10.1	II		

General Tests - Representative Materials

TABLE II (Continued)
TEST METHOD FSS RELEASE 453

Material No.	Code	Ignition Time (min.)	Flaming Time (Measured After 15 sec. Burner Removal) (min.)	Burn Length (Measured From Start Wire) (in.)		Burn Rate (Measured From Start Wire) (in./min.)	Burn Rate Initial 1.5 in. (in./min.)	Burn Rate Final 10 in. (in./min.)	Remarks
				Start	Final				
67	F3	0.08	0.00	0.0	0.0	I	I	I	
67		0.05	0.03	0.0	0.0				
67		0.05	0.07	0.0	0.0				
67		0.05	0.59	0.0	0.0				
Avg.		0.06	0.17	0.0	0.0				
89	F3	0.07	0.03	0.0	0.0	I	I	I	
89		0.07	0.03	0.0	0.0				
89		0.07	0.02	0.0	0.0				
89		0.07	0.05	0.0	0.0				
Avg.		0.07	0.03	0.0	0.0				

I Burned less than 1.5 inches (start wire)

II Burned less than 11.5 inches (stop wire)

X Burned full length

TABLE III
TEST METHOD 5902 - VERTICAL

Part 1 - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (Y-assured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout) (min.)	Burn Length (in.)	Char Length (in.)	Burn time (12 sec. Burner Time Inclined)			Remarks
		Flameout (min.)	Glow Time (Measuring After Flameout) (min.)				0-12 in. (in./min.)	12-10 in. (in./min.)		
1 R1	0.05	0.27			3.5	0.3	8.4	1		
1	0.05	0.23			2.0	0.0	5.2	1		
1	0.05	0.08			2.0	0.0	8.6	1		
Avg.	0.05	0.19			2.5	0.1	7.4	1		
2 F1	0.03	1.08			7.0	7.0	5.6	1		
3 F1	0.03	0.00			6.8	6.8	40.0	1		
4 F1	0.03	0.00			5.8	5.8	34.1	1		
5 F2	0.05	0.00		0.05	2.5	3.0	16.7	1		
5	0.03	0.00		0.05	2.5	0.7	15.0	1		
Avg.	0.04	0.00			2.5	1.9	15.8	1		
6 F1	0.05	0.77		1.25	12.0	12.0	X	13.1		
6	0.05	0.84		1.33	12.0	12.0	X	12.2		
6	0.03	0.72		1.33	12.0	12.0	X	13.6		
Avg.	0.05	0.77			12.0	12.0	X	12.9		
7 P1	0.05	1.12			12.0	12.0	X	12.0		
7	0.05	1.15			12.0	12.0	X	9.1		
7	0.05	1.15			12.0	12.0	X	9.2		
Avg.	0.05	1.14			12.0	12.0	X	9.2		
8 F2	0.03	0.00			6.1	6.1	36.5	1		
9 F2	0.03	0.00			6.1	6.1	36.5	1		
10 S1	0.03	0.10			5.4	5.4	20.2	1		
10	0.03	0.00			4.5	4.0	26.9	1		
Avg.	0.03	0.05			4.9	4.7	23.5	1		
										Heavy smoke

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part I - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time		Glow Time (Measured After 12 sec. Burner Removal)	Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) 0-12 in. (in./min.)	Burn Rate (12 sec. Burner Time Included) 12 in. (in./min.)	Remarks
		Measured After 12 sec. Burner Removal)	Flameout (min.)						
11 S3	0.03	0.37			3.0	1.5	5.6	1	
12 R1	0.07	4.78			12.0	12.0	x	2.4	
12	0.05	3.84			12.0	12.0	x	3.0	
Avg.	0.06	4.31			12.0	12.0	x	2.7	
13 P1	0.05	2.75			12.0	12.0	x	4.1	
13	0.05	1.77			12.0	12.0	x	6.3	
13	0.05	1.30			12.0	12.0	x	8.3	
13	0.05	1.69			12.0	12.0	x	6.5	
Avg.	0.05	1.88			12.0	12.0	x	6.4	
14 P1	0.05	1.18			12.0	12.0	x	9.0	
14	0.05	1.07			12.0	12.0	x	9.9	
14	0.05	1.12			12.0	12.0	x	9.5	
14	0.05	1.08			12.0	12.0	x	9.7	
Avg.	0.05	1.11			12.0	12.0	x	9.5	
15 P1	0.05	0.69			9.2	7.5	11.0	1	
15	0.07	0.75			7.5	4.6	8.5	1	
15	0.05	0.42			8.0	11.5	14.1	1	
15	0.05	0.87			8.0	9.0	7.9	1	
Avg.	0.05	0.68			8.2	8.1	10.6	1	
16 P1	0.03	0.45			7.0	3.0	11.3	1	
16	0.05	0.55			1.8	5.5	2.6	1	
16	0.03	0.38			5.0	6.5	9.1	1	
16	0.03	0.57			1.0	5.0	1.4	1	
Avg.	0.03	0.49			3.7	5.0	6.1	1	
17 P1	0.05	1.13			12.0	12.0	x	9.4	
17	0.05	1.10			12.0	12.0	x	9.6	
17	0.05	1.13			12.0	12.0	x	9.4	
17	0.05	0.99			12.0	12.0	x	10.6	
Avg.	0.05	1.09			12.0	12.0	x	9.8	

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part I - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)		Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) 0-12 in. (in./min.)	Burn Rate (12 sec. Burner Time Excluded) 12 in. (in./min.)	Remarks
		Meas.	Removal	Meas.	Out					
18 F1	0.07	1.70				12.0	12.0	x	x	
18	0.03	1.30				12.0	12.0	x	x	
18	0.03	1.45				12.0	12.0	x	x	
Avg.	0.04	1.48				12.0	12.0	x	x	
19 F1	0.08	1.42				8.0	8.3			Melts, drips to bottom of cabinet and burns
19	0.07	0.99				7.7	7.8			
19	0.03	2.08				12.0	12.0	x	x	
19	0.05	1.10				7.5	8.1			
Avg.	0.06	2.08				8.8	9.0	x	x	
20 F1	0.05	0.65				6.2	6.2			Melts, drips to bottom of cabinet and burns
20	0.05	0.38				7.7	7.7			
20	0.05	1.10				8.3	8.3			
20	0.05	0.59				5.4	5.4			
Avg.	0.05	0.68				6.9	6.9	x	x	
21 F2	0.05	0.15				3.5	2.8			Sooty smoke; acrid odor
21	0.03	0.68				3.5	2.8			
21	0.03	0.00				3.0	2.6			
21	0.03	0.00				3.8	3.1			
Avg.	0.04	0.06				3.4	2.8			
22 F2	0.03	0.00				7.0	1.0			
22	0.03	0.00				2.8	1.2			
22	0.05	0.00				2.6	1.0			
22	0.05	0.00				3.0	1.1			
Avg.	0.04	0.00				3.9	1.1			
23 F2	0.05	0.78				11.0	9.5			
23	0.03	1.17				12.0	12.0	x	x	
23	0.03	1.08				12.0	12.0	x	x	
23	0.03	0.84				12.0	12.0	x	x	
Avg.	0.04	1.03				11.8	11.4	x	x	
										Heavy, sooty smoke; acrid odor

Part 1 - General Tests - Representative Materials

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Material No.	Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal) (min.)		Glow Time (Measured After Flameout) (min.)	Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) 0-12 in. (in./min.)	Burn Rate (12 in. (in./min.)	Remarks
			After Removal	After Flameout						
24	P2	0.03	0.00			3.8	2.5	22.8	1	
24		0.03	0.00			2.5	2.0	15.0	1	
24		0.03	0.00			3.0	3.0	18.0	1	
24		0.03	0.00			3.2	3.4	19.2	1	
<i>Avg.</i>		0.03	0.00			3.1	2.7	18.8	1	
25	L1	0.05	0.07			0.6	0.0	0.0	1	
25		0.05	0.89			1.5	0.0	1.4	1	
<i>Avg.</i>		0.05	0.48			0.8	0.0	0.8	1	
25		0.05	0.15			2.0	0.0	6.7	1	No. 25 specimen without pad backing
26	R1	0.07	3.72			12.0	12.0	x	3.1	
26		0.05	3.92			12.0	12.0	x	2.9	
26		0.05	3.74			12.0	12.0	x	3.1	
26		0.07	3.59			12.0	12.0	x	3.2	
<i>Avg.</i>		0.06	3.74			12.0	12.0	x	3.1	
27	R2	0.10	6.12			12.0	12.0	x	1.9	
27		0.10	5.72			12.0	12.0	x	2.1	
27		0.07	6.25			12.0	12.0	x	1.9	
27		0.07	6.55			12.0	12.0	x	1.8	
<i>Avg.</i>		0.08	6.16			12.0	12.0	x	1.9	
28	P2	0.05	0.00			2.3	1.0	15.3	1	
28		0.05	0.00			1.9	0.4	12.7	1	
28		0.05	0.00			2.7	1.3	18.0	1	
28		0.05	0.00			2.0	0.5	13.3	1	
<i>Avg.</i>		0.05	0.00			1.6	0.8	14.8	1	
29	L1	0.05	0.00			2.0	0.0	13.3	1	
29		0.05	0.00			0.12	4.0	0.0	26.6	1
29		0.05	0.00			0.10	3.5	0.0	23.3	1
29		0.05	0.00			0.12	3.0	0.0	20.0	1
<i>Avg.</i>		0.05	0.00			0.11	3.1	0.0	20.8	1

Part 1 - General Tests - Representative Materials

TABLE III (Continued)
TEST METHOD S902 - VERTICAL

Material No.	Iignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)		Burn Length (in.)	Char Length (in.)	Burn Rate (17 sec. Burner Time Included) 0-12 in. (in./min.)	Remarks
		(min.)	(min.)	(min.)	(min.)				
30 S3	0.05	0.00				0.0	0.0	0.0	I
30	0.05	0.00				0.0	0.0	0.0	I
30	0.05	0.00				0.0	0.0	0.0	I
30	0.05	0.00				0.0	0.0	0.0	I
Avg.	0.05	0.00				0.0	0.0	0.0	I
31 S3	0.03	0.00				0.0	0.0	0.0	I
31	0.03	0.00				0.0	0.0	0.0	I
31	0.03	0.00				0.0	0.0	0.0	I
31	0.03	0.00				0.0	0.0	0.0	I
Avg.	0.03	0.00				0.0	0.0	0.0	I
32 S3	0.05	3.45				12.0	12.0	X	3.3
32	0.05	4.25				12.0	12.0	X	2.6
32	0.05	4.43				12.0	12.0	X	2.6
32	0.05	4.55				12.0	12.0	X	2.6
Avg.	0.05	4.17				12.0	12.0	X	2.8
33 S3	0.05	0.00				0.0	0.0	0.0	I
33	0.03	2.84				12.0	12.0	X	4.0
33	0.05	3.42				12.0	12.0	X	3.4
33	0.05	2.67				12.0	12.0	X	4.3
Avg.	0.05	2.97				12.0	12.0	X	3.9
34 S3	0.03	0.00				1.1	0.0	6.6	I
34	0.03	0.00				1.0	0.0	6.0	I
34	0.03	0.00				1.0	0.0	6.0	I
34	0.03	0.00				1.2	0.0	7.2	I
Avg.	0.03	0.00				1.1	0.0	6.5	I
35 S2	0.03	0.22				3.0	2.5	8.0	I
35	0.03	2.07				12.0	12.0	X	5.4
35	0.03	1.85				12.0	12.0	X	5.9
35	0.03	1.85				12.0	12.0	X	5.9
Avg.	0.03	1.90				9.8	9.6	6.3	I
36 F2	0.03	2.55				12.0	12.0	X	4.4

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part 1 - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)		Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) C-12 in. (in./min.)	Remarks
		After Removal (min.)	After Flameout (min.)	After Flameout (min.)	After Flameout (min.)				
37 F2	0.03		1.27			12.0	12.0	X	8.4
37	0.05		1.89			12.0	12.0	X	5.9
Avg.	0.04		1.58			12.0	12.0	X	7.1
38 F2	0.03		1.05			12.0	12.0	X	9.9
38	0.03		0.95			12.0	12.0	X	10.7
Avg.	0.03		1.00			12.0	12.0	X	10.3
40 F2	0.03		0.70			12.0	12.0	X	13.8
40	0.03		0.43			12.0	12.0	X	20.0
40	0.03		0.42			12.0	12.0	X	20.5
40	0.03		0.38			12.0	12.0	X	21.8
Avg.	0.03		0.48			12.0	12.0	X	19.0
41 R1	0.07		3.37			12.0	12.0	X	3.4 Heavy smoke
41	0.05		3.78			12.0	12.0	X	3.1
41	0.07		3.22			12.0	12.0	X	3.6
41	0.05		3.87			12.0	12.0	X	3.0
Avg.	0.06		3.56			12.0	12.0	X	3.3
42 F1	0.03		1.62			12.0	12.0	X	6.7 Heavy smoke
42	0.03		1.37			12.0	12.0	X	7.8
42	0.03		1.62			12.0	12.0	X	6.7
42	0.03		1.74			12.0	12.0	X	6.3
Avg.	0.03		1.59			12.0	12.0	X	6.9
43 F1	0.03		0.7			12.0	12.0	X	13.6 Moderate, blue-black smoke
43	0.05		0.71			12.0	12.0	X	13.6
43	0.03		0.76			12.0	12.0	X	12.6
43	0.03		0.84			12.0	12.0	X	12.6
Avg.	0.03		0.77			12.0	12.0	X	13.1
44 F1	0.05		0.75			10.0	6.6	11.1	1
44	0.05		0.92			10.0	9.5	9.4	1
44	0.05		1.10			10.5	9.5	8.0	1
44	0.05		0.72			11.0	11.8	12.7	1
Avg.	0.05		0.87			10.4	9.6	10.3	1

Part 1 - General Tests - Representative Materials

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Material No.	Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal) (min.)	Glow Time (Measured After Flameout) (min.)		Burn Length (in.)	Char Length (in.)	Burn Rate (1/2 sec. Burner Time Included) 0-1/2 in. (in./min.)	Remarks
				Flameout	After Flameout				
45	F1	0.05	1.28			12.0	12.0	x	8.4
45		0.03	2.28			12.0	12.0	x	4.9
45		0.03	1.25			12.0	12.0	x	8.5
45		0.03	1.35			12.0	12.0	x	7.9
Avg.		0.03	1.56			12.0	12.0	x	7.4
46	F2	0.05	0.67			1.0	1.0	x	8.3
46		0.07	0.23			2.5	2.2	x	6.8
46		0.35	0.00			1.7	0.7	x	11.3
46		0.05	0.00			1.6	0.2	x	10.6
Avg.		0.06	0.30			1.9	1.0	x	9.2
47	S1	0.03	0.64			12.0	12.0	x	15.0
47		0.03	0.59			12.0	12.0	x	16.0
47		0.03	0.62			12.0	12.0	x	15.3
47		0.03	0.50			12.0	12.0	x	18.0
Avg.		0.03	0.59			12.0	12.0	x	16.1
48	F2	0.07	0.00		0.08	2.0	0.6	14.6	I
48		0.05	0.00		0.20	2.0	0.9	13.3	I
48		0.07	0.00		0.23	1.2	1.2	8.8	I
48		0.07	0.00		0.22	2.0	0.9	13.3	I
Avg.		0.06	0.00		0.18	1.8	0.9	12.5	I
49	F2	0.05	0.10		0.22	3.4	0.5	13.6	I
49		0.05	0.07		0.22	3.2	0.5	14.7	I
49		0.63	0.10		0.23	3.4	0.6	12.7	I
49		0.03	0.10		0.20	3.6	0.6	13.4	I
Avg.		0.06	0.09		0.22	3.4	0.6	13.6	I
50	F2	0.03	1.02			12.0	7.0	x	10.1
50		0.03	0.52			12.0	5.0	x	17.5
50		0.1	0.75			12.0	10.0	x	13.1
50		0.0	0.64			12.0	4.0	x	15.0
Avg.		0.07	0.73			12.0	6.5	x	13.9

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part 1 - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)	Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included)	Remarks
		min.)	(min.)					
51 F2	0.03	0.00			2.5	0.2	15.0	I
51	0.03	0.00			2.5	1.0	15.0	I
52	0.03	0.00			2.5	1.0	15.0	I
51	0.03	0.00			2.3	1.0	13.8	I
Av.	0.03	0.00			2.5	0.8	14.7	I
52 F2	0.03	0.00			2.4	1.0	14.4	I
52	0.03	0.00			1.2	0.5	7.2	I
52	0.03	0.00			1.2	0.0	7.2	I
52	0.03	0.00			1.1	0.0	6.6	I
Av.	0.03	0.00			1.5	0.4	8.9	I
53 F2	0.03	0.00		0.02	4.5	0.2	27.0	I
53	0.03	0.00		0.02	4.0	0.3	24.0	I
53	0.03	0.00			4.2	0.2	25.1	I
53	0.03	0.00			4.2	0.2	25.1	I
Av.	0.03	0.00			4.2	0.2	25.2	I
54 F2	0.03	0.00			1.8	0.0	10.8	I
54	0.03	0.00			1.0	0.0	6.0	I
54	0.03	0.00			1.0	0.0	6.0	I
54	0.03	0.00			0.8	0.0	4.8	I
Av.	0.03	0.00			1.2	0.0	6.9	I
55 F2	0.05	0.00		0.07	2.0	0.0	13.0	I
55	0.03	0.00		0.00	1.8	0.0	10.8	I
55	0.03	0.00		0.07	1.6	0.0	9.6	I
55	0.03	0.00		0.10	2.1	0.0	12.6	I
Av.	0.03	0.00			1.9	0.0	11.6	I
56 F2	0.03	0.00		0.03	2.0	0.6	12.0	I
56	0.03	0.00		0.02	3.0	1.3	18.0	I
56	0.03	0.00		0.03	2.6	1.0	15.6	I
56	0.03	0.00		0.03	2.7	0.8	16.2	I
Av.	0.03	0.00			2.1	0.9	15.5	I

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part 1 • General Tests - Representative Materials

Material No.	Code	Ignition Time (min.)	Flaming Time Measured After 12 sec. Burner Removal (min.)	Glow Time Measured After Flameout (min.)	Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Interval)		
							(12 in./min.)	(12 in./min.)	(12 in./min.)
57	L1	0.03	0.30	0.05	6.6	1.0	39.5	1	Vinyl melts, exposes perforations
57		0.03	0.00		6.2	0.7	37.1	1	
57		0.03	0.00		6.9	1.0	41.3	1	
57		0.03	0.00		7.1	0.9	42.5	1	
<i>Avg.</i>		0.03	0.00		6.7	0.9	40.1	1	
58	L2	0.05	0.00		3.2	0.7	21.3	1	Gold material
58		0.03	0.00		3.0	0.6	18.0	1	Bubbles, bursts into gaseous flame
58		0.03	0.00		3.1	0.5	12.0	1	
58		0.03	0.00		3.0	0.6	18.0	1	Black, sooty smoke
<i>Avg.</i>		0.03	0.00		3.1	0.6	18.8	1	
59	L2	0.03	0.00		3.7	0.6	22.2	1	Black, sooty smoke
59		0.03	0.00		3.7	0.6	22.2	1	
59		0.03	0.00		3.3	0.4	17.8	1	
59		0.03	0.00		3.6	0.5	21.6	1	
<i>Avg.</i>		0.03	0.00		3.5	0.5	20.9	1	
60	F2	0.02	0.00	0.05	3.0	0.4	16.4	1	
60		0.02	0.00	0.73	3.2	0.3	17.5	1	
60		0.02	0.00	0.03	3.4	0.4	18.6	1	
60		0.02	0.00	0.02	3.4	0.3	18.6	1	
<i>Avg.</i>		0.02	0.00		3.3	0.4	17.8	1	
61	F2	0.00	0.00		3.7	3.7	18.5	1	Blue gray smoke
61		0.07	0.00		4.5	4.5	33.8	1	
61		0.05	0.00		5.4	5.4	40.6	1	
<i>Avg.</i>		0.06	0.00		4.5	4.5	31.0	1	
62	F2	0.03	0.00		5.2	5.2	31.1	1	
62		0.03	0.00		5.7	5.7	34.1	1	
62		0.03	0.00		5.0	5.0	30.0	1	
62		0.03	0.00		4.4	4.4	26.3	1	
<i>Avg.</i>		0.03	0.00		5.1	5.1	30.4	1	

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part I - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)	Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included)		Remarks
		(min.)	(min.)				0-12 in.	12 in. (in./min.)	
63 F2	0.03	0.00	0.00		4.3	4.3	25.7	1	
63	0.02	0.00	0.00		5.7	5.7	31.1	1	
63	0.02	0.00	0.00		6.2	6.2	33.9	1	
63	0.02	0.00	0.00		4.4	4.4	24.0	1	
AVR.	0.02	0.00	0.00		5.2	5.2	28.7	1	
64 F2	0.02	0.42		12.0	12.0	X	20.0		Heavy smoke
64	0.02	0.38		12.0	12.0	X	21.2		
64	0.02	0.45		12.0	12.0	X	18.9		
64	0.02	0.48		12.0	12.0	X	18.0		
AVR.	0.02	0.43		12.0	12.0	X	19.5		
65 F2	0.02	0.00		2.2	0.0	12.0			
65	0.02	0.00		2.0	0.0	10.9			
65	0.02	0.00		1.0	0.0	5.6			
65	0.02	0.00		1.2	0.0	6.6			
AVR.	0.02	0.00		1.6	0.0	8.8			
66 S1	0.02	0.00		3.2	2.4	17.5			
66	0.02	0.00		3.2	2.4	17.5			
66	0.02	0.00		4.4	2.2	24.0			
66	0.02	0.00		4.8	2.2	26.2			
AVR.	0.02	0.00		3.9	2.3	21.3			
67 F3	0.05	1.23	2.17	9.0	8.5	6.5			
67	0.05	0.78	2.06	5.0	5.0	5.4			
67	0.05	0.92	3.00	6.4	5.8	6.0			
67	0.05	1.07	3.92	8.0	6.5	6.5			
AVR.	0.05	1.00		7.1	6.5	6.1			
68 S1	0.02	0.67		12.0	12.0	X	14.1		
68	0.02	0.95		12.0	12.0	X	10.6		
68	0.02	1.33		8.0	8.5	5.3			
68	0.02	0.75		12.0	12.0	X	12.8		
AVR.	0.02	0.93		11.0	11.1	13.2			

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part I - General Tests - Representative Materials

Material- No.	Initiation Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)		Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) 0-12 in. (in./min.)	Burn Rate (12 sec. Burner Time Excluded) 12 in. (in./min.)	Remarks
		Flaming Time (min.)	Glow Time (min.)	Flameout	Flameout					
69	S2	0.02	0.00			0.1	0.0	0.5	1	
69		0.02	0.00			0.1	0.0	0.5	1	
69		0.02	0.00			0.1	0.0	0.5	1	
69		0.02	0.00			0.1	0.0	0.5	1	
<i>Avg.</i>		0.02	0.00			0.1	0.0	0.5	1	
70	F1	0.03	0.00			6.4	4.1	38.3	1	
70		0.02	0.00			6.4	4.3	35.0	1	
70		0.02	0.00			5.4	3.5	30.0	1	
70		0.02	0.00			5.6	3.4	30.6	1	
<i>Avg.</i>		0.02	0.00			6.0	3.8	33.5	1	
76	A	0.00	0.00			0.0	0.1	0.0	1	
76		0.12	0.00			0.0	0.1	0.0	1	
<i>Avg.</i>		0.06	0.00			0.0	0.1	0.0	1	
77	S3	0.07	9.75			12.0	12.0	x	1.2	
77		0.07	7.12			12.0	12.0	x	1.7	
<i>Avg.</i>		0.07	8.43			12.0	12.0	x	1.4	
80	A	0.12	0.20			0.0	0.0	0.0	1	
<i>Avg.</i>		0.12	0.20			0.0	0.0	0.0	1	
81	A	0.08	0.59			0.0	0.0	0.0	1	
<i>Avg.</i>		0.08	0.59			0.0	0.0	0.0	1	
82	A	0.07	0.43			0.0	0.0	0.0	1	
<i>Avg.</i>		0.07	0.43			0.0	0.0	0.0	1	
83	A	0.07	0.42			0.0	0.0	0.0	1	
<i>Avg.</i>		0.07	0.42			0.0	0.0	0.0	1	
84	A	0.05	0.33			0.0	0.0	0.0	1	
<i>Avg.</i>		0.05	0.33			0.0	0.0	0.0	1	

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part I - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)	Glow Time (Measured After Flameout)	Burn Length (in.)	Char Length (in.)	Burn Rate			
						Time Included)	0-12 in. (in./min.)	12 in. (in./min.)	Remarks
81 L3	0.00	0.00		0.0	0.0	6.0	1		
86 L3	0.00	0.00		0.0	0.0	6.0	1		
AVR.				0.0	0.0	0.0	0.0		
87 L3	0.00	0.00		0.0	0.0	0.0	0.0		
AVR.				0.0	0.0	0.0	0.0		
88 L3	0.00	0.01		0.0	0.0	0.0	0.0		
AVR.				0.0	0.0	0.0	0.0		
89 F3	0.07	1.22	2.00	12.0	12.0	X	8.8		
89	0.07	1.53	2.50	12.0	12.0	X	7.2		
89	0.07	1.74	2.17	12.0	12.0	X	6.4		
89	0.07	1.67	2.33	12.0	12.0	X	6.7		
AVR.		1.54		12.0	12.0	X	7.3		
92 F2	0.05	0.02		2.8	2.8	16.8	1		
92	0.05	0.00		3.2	3.0	21.3	1		
92	0.05	0.33		2.2	3.0	4.5	1		
92	0.05	0.23		3.2	3.8	8.4	1		
AVR.		0.15		2.9	3.2	12.8	1		
93 F2	0.05	0.00		1.6	1.2	10.0	1		
93	0.03	0.05		2.3	2.0	10.6	1		
93	0.03	0.10		2.0	0.3	7.5	1		
93	0.03	1.17		2.2	2.0	6.6	1		
AVR.		0.33		2.0	1.4	8.7	1		
94 F2	0.02	0.07		2.0	0.2	9.2	1		
94	0.07	0.00		1.6	1.7	9.6	1		
94	0.07	0.00		1.8	1.5	10.8	1		
94	0.07	0.00		1.7	1.6	10.2	1		
AVR.		0.01		1.8	1.3	10.0	1		

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part I - General Tests - Representative Materials

Material No.	Code	Ignition Time (min.)	Planting Time		Glow Time Measured After Flameout (min.)	Burn Length (in.)	Char Length (in.)	Burn Rate		Remarks
			Heated After 12 sec. Burner Removal (min.)	(min.)				0-12 in. Time Included (in./min.)	12 in. Time Included (in./min.)	
95	S1	0.03	0.00			2.6	2.9	15.6	1	
95		0.03	0.00			1.6	2.0	9.6	1	
Avg.		0.03	0.00			2.1	2.4	12.6	1	
96	S1	0.32	0.00			2.0	0.2	10.9	1	
96		0.02	0.00			2.0	0.2	10.9	1	
96		0.02	0.00			2.0	0.8	10.9	1	
96		0.02	0.00			2.0	0.8	10.9	1	
Avg.		0.02	0.00			2.0	0.5	10.9	1	
97	S1	0.02	0.02			3.0	0.7	15.0	1	Moderate, heavy smoke
97		0.02	0.00			3.0	1.0	16.3	1	Sample deforms
97		0.02	0.00			2.5	0.7	13.7	1	
97		0.02	0.00			2.5	1.0	13.7	1	
Avg.		0.02	0.01			2.7	0.9	14.6	1	
98	S1	0.32	0.05			3.0	0.3	12.9	1	
98		0.02	0.03			3.5	0.4	16.2	1	
98		0.02	0.00			3.4	0.4	18.6	1	
98		0.02	0.08			3.4	1.0	12.8	1	
Avg.		0.02	0.04			3.3	0.5	15.1	1	
99	X2	0.07	0.94			1.2	0.2	1.1	1	
99		0.07	1.08			1.1	0.2	0.9	1	
Avg.		0.07	1.01			1.1	0.2	1.0	1	
100	R1	0.05	0.40			2.5	0.1	4.5	1	
100		0.05	0.38			2.6	0.1	4.9	1	
Avg.		0.05	0.39			2.6	0.1	4.7	1	
107(1)	S1	0.03	0.05			2.5	5.0	11.3	1	Bad backing burns 12 inches
Avg.		0.03	0.05			2.5	5.0	11.3	1	

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part 1 - General Tests - Representative Materials

Material No.	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)	Glow Time (Measured After Flameout)	Burn Length (in.)	Char Length (in.)	Burn Rate		Remarks
						(in.)	(in./min.)	
108 (1) S1	0.03	0.00 (2)		1.0	2.7	10.0	1	Black, dense smoke; acrid odor
Avg.		0.00		1.0	2.7	10.0	1	

Note (1): Materials 137, 103 and 109 were only 1/2 inches in length.

Note (2): Material 108 flared out 0.12 inches before burner removal.

I Burned less than 12 inches

X Burned full length

TABLE III
TEST METHOD 5902 - VERTICAL

Part 2 - Special Tests - New, Used and Cleared Materials

Material No.	Code	Ignition Time (min.)	Pleinage Time (Measured After 12 sec. Burner Removal) (min.)	Glow Time (Measured After Flameout) (min.)		Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) 0-12 in. (in./min.)	Burn Rate (12 sec. Burner Time Included) 12 in. (in./min.)	Remarks
				Burn Time (min.)	Flameout (min.)					
13N(1)	F1	0.05		1.37		12.0	12.0	X	7.9	Very light smoke
13N		0.05		1.28		12.0	12.0	X	8.4	
Avg.		0.05		1.33		12.0	12.0	X	8.2	
13NC	F1	0.05		1.45		12.0	12.0	X	7.5	
13NC		0.05		1.48		12.0	12.0	X	7.4	
Avg.		0.05		1.46		12.0	12.0	X	7.4	
13U	F1	0.05		1.20		12.0	12.0	X	8.9	
13U		0.05		1.30		12.0	12.0	X	8.3	
Avg.		0.05		1.25		12.0	12.0	X	8.6	
13UC	F1	0.05		1.07		12.0	12.0	X	9.8	
13UC		0.05		1.59		12.0	12.0	X	6.9	
Avg.		0.05		1.33		12.0	12.0	X	8.3	
18N	F1	0.05		1.48		9.7	9.7	6.0	1	Very light smoke, melts, drips to bottom of cabinet and burns
18N		0.05		1.70		10.0	10.0	5.4	1	
Avg.		0.05		1.59		9.9	9.9	5.7	1	
18KC	F1	0.05		1.05		10.5	10.5	8.8	1	
18NC		0.05		1.32		10.0	10.0	6.8	1	
Avg.		0.05		1.18		10.3	10.3	7.8	1	
18UC	F1	0.05		1.89		12.0	12.0	X	5.9	
18UC		0.05		1.32		12.0	12.0	X	5.9	
Avg.		0.05		1.61		12.0	12.0	X	5.9	
19N	F1	0.05		0.60		7.3	7.3	9.7	1	Light smoke, melts, drips to bottom of cabinet and burns
19N		0.05		0.84		7.0	7.0	7.1	1	
Avg.		0.05		0.72		7.2	7.2	8.4	1	

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part 2 - Special Tests - New, Used and Cleaned Materials

Material No.	Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)		Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) 0-12 in. (in./min.)	Burn Rate (12 sec. Burner Time Included) 12 in. (in./min.)	Remarks
			Flameout	Time (min.)	Flameout	Time (min.)					
19NC	F1	0.05	0.97				7.0	7.0	6.3	1	
19NC		0.05	0.84				7.1	7.1	7.2	1	
Avg.		0.05	0.91				7.1	7.1	6.7	1	
19U	F1	0.05	0.74				12.0	12.0	13.5	1	
19U		0.05	0.50				8.3	8.3	12.8	1	
Avg.		0.05	0.62				10.2	10.2	13.1	1	
19UC	F1	0.05	0.75				8.0	8.0	8.9	1	Melts, drips to bottom of cabinet and burns
19UC		0.05	0.42				7.8	7.8	13.9	1	
Avg.		0.05	0.58				7.9	7.9	11.4	1	
20N	F1	0.05	0.53				5.6	5.6	8.2	1	
20N		0.05	0.53				5.5	5.5	8.1	1	
Avg.		0.05	0.53				5.6	5.5	8.1	1	
20NC	F1	0.05	0.90				6.9	6.9	6.6	1	
20NC		0.05	0.50				6.1	6.1	9.4	1	
Avg.		0.05	0.70				6.5	6.5	8.5	1	
20U	F1	0.05	0.40				6.0	6.0	10.9	1	
20U		0.05	0.92				6.7	6.7	6.3	1	
Avg.		0.05	0.66				6.6	6.4	8.6	1	
20UC	F1	0.05	0.50				6.0	6.0	9.2	1	
20UC		0.05	0.13				6.2	6.2	10.7	1	
Avg.		0.05	0.47				6.1	6.1	9.9	1	
27NC	R2	0.05	2.42				2.6	1.8	1.0	1	
27NC		0.05	2.52				1.8	1.0	0.7	1	
Avg.		0.05	2.47				2.2	1.4	0.8	1	

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL

Part 2 - Special Tests - New, Used and Cleaned Materials

Material No.	Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout) (min.)	Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included)		Remarks
			(min.)	(min.)				0-12 in. (in./min.)	12 in. (in./min.)	
27U	R2	0.05	2.94		1.33	5.0	3.8	1.6	1	
27U		0.05	6.18		1.28	12.0	9.5	X	1.9	
Avg.		0.05	4.56		1.31	8.5	6.7	1.8	1	
27UC	R2	0.05	0.97		1.17	1.0	0.2	0.9	1	
27UC		0.05	1.52		1.33	1.3	0.4	0.8	1	
Avg.		0.05	1.24		1.25	1.2	0.3	0.8	1	
99N	R2	0.07	0.94		1.17	1.2	0.2	1.1	1	
99N		0.07	1.08		1.33	1.1	0.2	0.9	1	
Avg.		0.07	1.01		1.25	1.2	0.2	1.0	1	
99NC	R2	0.05	0.85		1.17	1.5	0.2	1.5	1	
99NC		0.05	0.84		1.25	2.0	0.3	2.0	1	
Avg.		0.05	0.85		1.21	2.8	0.3	1.7	1	
99U	R2	0.05	3.25			5.0	7.0	1.5	1	
99U		0.05	7.33			12.0	12.0	X	1.6	
Avg.		0.05	5.29			8.5	9.5	1.6	1	
99UC	R2	0.05	2.74			4.0	5.0	1.5	1	
99UC		0.05	3.00			3.0	3.2	1.0	1	
Avg.		0.05	2.87			3.5	4.1	1.2	1	
100N	R1	0.05	0.40			2.5	0.1	4.5	1	
100N		0.05	0.38			2.6	0.1	4.9	1	
Avg.		0.05	0.39			2.6	0.1	4.7	1	
100NC	R1	0.05	0.53			2.0	0.1	2.9	1	
100NC		0.05	0.20			1.8	0.1	5.1	1	
Avg.		0.05	0.37			1.9	0.1	4.0	1	

Part 2 - Special Tests - New, Used and Cleaned Materials

TABLE III (Continued)
TEST METHOD 5902 - VERTICAL.

Material <u>No.</u>	Code	Ignition Time (min.)	Flaming Time (Measured After 12 sec. Burner Removal)		Glow Time (Measured After Flameout)	Burn Length (in.)	Char Length (in.)	Burn Rate (12 sec. Burner Time Included) 0-12 in. (in./min.)	Burn Rate (12 sec. Burner Time Included) 12 in. (in./min.)	Remarks
			12 sec.	Burner (min.)						
100U	R1	0.05		0.17		2.0	0.1	6.3	1	
100U		0.05		0.15		2.1	0.1	7.0	1	
<u>Avg.</u>		<u>0.05</u>		<u>0.16</u>		<u>2.1</u>	<u>0.1</u>	<u>6.6</u>	<u>1</u>	
100UC	R1	0.05		0.33		3.5	0.1	7.5	1	
100UC		0.15		0.22		3.4	0.1	9.2	1	
<u>Avg.</u>		<u>0.10</u>		<u>0.27</u>		<u>3.5</u>	<u>0.1</u>	<u>8.4</u>	<u>1</u>	

Note (1): Letters after material no. signify: N - New; NC - New and Cleaned; U - Used; UC - Used and Cleaned

TABLE IV
TEST METHOD NBS RADIANT PANEL

Part I - General Tests - Representative Materials

<u>Material No.</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Fac. (mg.)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_s)</u>	<u>Coefficient of Variation (Percent)</u>	<u>Remarks</u>
1 R1		6-9				12	4.95	14	
1		6-9				29	6.76	45	
1	0.22	6-9	1.4			28	1.93	12	
<u>Avg.</u>						23	4.54	24	64
									Melts away from pilot before ignition
2 F1	0.16	0	4.9	0.0		16	1.00	0	
2		6-9				8	3.57	11	
<u>Avg.</u>									50
									Melts away from pilot before ignition
3 F1		0		0.0		0	1.00	0	
3		0		0.0		0	1.00	0	
3		0		0.0		0	1.00	0	
<u>Avg.</u>									0
									Melts away from pilot before ignition
4 F1		0		0.0		0	1.00	0	
4		0		0.0		0	1.00	0	
4		0		0.0		0	1.00	0	
<u>Avg.</u>									0
									Melts away from pilot before ignition
5 F2		9-12				33	13.08	98	
5		12-15				51	24.17	281	
<u>Avg.</u>						42	18.63	190	48
									Melts and drops against screen
6 F1		15+		0.8		47	19.13	205	
6		15+		0.3		64	25.34	370	
6		6-9				8	10.00	18	
<u>Avg.</u>						4.0	18.16	198	73
7 F1		15+		0.6		57	33.21	432	
7		15+		0.8		60	27.17	372	
<u>Avg.</u>				0.7		53	30.19	402	7

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_b)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
3	F1		15+		3.9	58	16.97	224		
8			15+		3.7	78	16.47	293		
<u>Avg.</u>					3.8	68	16.72	258	13	
9	F2	0		0.4	0	0	1.00	0		
9		0		0.0	0	0	1.00	0		
<u>Avg.</u>		0		0.0	0	0	1.00	0	0	
10	S1		15+	0.0	1.6	79.72	291			
10		9-12		1.4	16	27.41	100			
<u>Avg.</u>				0.7	16	53.56	195	68		
11	S3		3-6	0.8	47	2.30	25			
11		0.30	12-15	1.2	36	7.19	59			
11		0.56	12-15	30.0	59	7.47	100			
<u>Avg.</u>	0.43			18.9	1.0	42	5.65	61	50	
12	R1		15+		1.1	152	10.64	369		
12		0.11	15+	5.8	1.1	150	9.06	310		
<u>Avg.</u>					1.1	181	9.77	403		
13	F1	0.15	15+	9.1	1.2	86	13.82	271		
13		0.15	15+	15.0	0.1	69	13.71	216		
13		0.18	15+	15.8	0.7	74	13.05	220		
13		0.19	15+	15.0	0.9	51	12.68	147		
<u>Avg.</u>	0.17			13.7	0.7	70	13.32	214	21	
14	F1	0.20	15+	15.8	0.4	48	13.67	150		
14		0.16	15+	15.8	0.5	38	13.63	118		
14		0.17	15+	18.8	0.5	48	14.82	162		
14		0.16	15+	18.8	0.6	38	15.75	137		
<u>Avg.</u>	0.17			17.3	0.5	43	14.47	142	10	

TABLE IV (continued)
TEST METHOD NBS RADIANT PANEL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_s)</u>	<u>Coefficient of variation (percent)</u>	<u>Remarks</u>
15	F1	0.10	15+	19.1	3.8	24	9.96	55		
15		0.10	0-3		3.1	6	1.00	1.4		
15		0.10	12-15	11.5	2.0	27	9.67	60		
15		0.11	15+	18.8	2.1	16	13.20	48		
<u>Avg.</u>		<u>0.10</u>		<u>16.5</u>	<u>2.8</u>	<u>18</u>	<u>8.46</u>	<u>41</u>	<u>57</u>	<u>-</u>
16	F1	0.06	9-12	25.0	0.4	39	9.96	89		
16		0.08	3-6	17.6	0.2	22	5.00	25		
16		0.19	0-3		0.2	23	1.00	5.2		
16		0.12	0-3		0.1	28	1.00	6.4		
<u>Avg.</u>		<u>0.11</u>		<u>21.3</u>	<u>0.2</u>	<u>28</u>	<u>4.24</u>	<u>31</u>	<u>109</u>	<u>-</u>
17	F1	0.12	15+	12.0	1.2	46	12.69	133		
17		0.07	15+	7.9	1.1	38	12.45	108		
17		0.12	15+	9.7	0.9	44	10.87	109		
17		0.18	15+	11.5	1.7	36	13.33	109		
<u>Avg.</u>		<u>0.12</u>		<u>10.5</u>	<u>1.2</u>	<u>41</u>	<u>12.34</u>	<u>114</u>	<u>9</u>	<u>-</u>
18	F1	0.16	15+	11.1	1.0	44	14.17	142		
18		0.05	15+	7.5	0.8	29	15.33	101		
18		0.22	15+	12.5	0.8	25	11.20	64		
18		0.20	15+	20.0	0.7	14	14.50	46		
<u>Avg.</u>		<u>0.16</u>		<u>12.8</u>	<u>0.9</u>	<u>28</u>	<u>13.80</u>	<u>88</u>	<u>42</u>	<u>-</u>
19	F1	0.16	15+	2.4	0.3	29	9.34	62		
19		0.12	9-12	7.9	0.1	10	7.25	17		
19		0.16	12-15	18.8	0.1	13	8.2	24		
19		0.20	12-15	8.1	0.5	9	7.15	15		
<u>Avg.</u>		<u>0.16</u>		<u>9.3</u>	<u>0.3</u>	<u>15</u>	<u>7.99</u>	<u>29</u>	<u>64</u>	<u>-</u>
20	F1	0.14	0-3		0.1	19	1.00	4.3		
20		0.17	0-3		0.4	19	1.00	4.3		
20		0.17	0-3		0.4	21	1.00	4.8		
20		0.10	0-3		0.3	17	1.00	3.9		
<u>Avg.</u>		<u>0.14</u>			<u>0.3</u>	<u>19</u>	<u>1.00</u>	<u>4.3</u>	<u>7</u>	<u>-</u>

TABLE IV(Continued)
TEST METHOD NBS RADIANT PANEL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_n)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
21	F2	0.12	9-12	25.0	1.1	15	26.01	89		
21	F2	0.07	9-12	21.4	1.3	22	20.57	103		
21	F2	0.09	9-12	17.6	1.9	11	14.46	36		
21	F2	0.10	12-15	16.7	1.4	7	20.35	33		
Avg.		0.09		20.2	1.4	14	20.35	65	48	
22	F2	0.05	9-12	25.0	1.2	9	8.96	18		
22	F2	0.05	6-9	12.0	0.8	22	8.33	42		
22	F2	0.08	6-9	11.1	0.3	18	10.53	43		
22	F2	0.07	3-6	12.0	0.4	19	4.12	18		
Avg.		0.06		15.0	0.7	17	7.99	30	40	
23	F2	0.06	15+	16.7	1.7	66	26.16	394		
23	F2	0.05	15+	17.6	3.4	38	28.30	245		
23	F2	0.07	15+	16.7	3.8	49	24.48	274		
23	F2	0.10	15+	17.6	1.9	39	35.38	316		
Avg.		0.07		17.2	2.7	48	28.63	307	18	
24	F2	0.07	6-9	5.9	1.3	14	6.16	20		
24	F2	0.10	9-12	4.4	3.0	20	18.37	84		
24	F2	0.12	6-9	5.7	2.0	22	4.21	21		
24	F2	0.10	c-9	6.0	2.1	12	9.94	27		
Avg.		0.09		5.5	2.1	17	9.67	38	70	
25	L1	0.35	9-12	2.8	16.1	65	4.76	71		
25	L1	0.11	12-15	13.4	18.3	71	12.91	209		
25	L1	0.14	12-15	2.2	14.5	68	7.66	119		
25	L1	0.10	12-15	2.3	12.3	61	10.13	141		
Avg.		0.10		5.2	15.3	66	8.86	136	37	
26	R1	0.15	6-12	2.7	2.6	52	3.72	44		
26	R1	0.12	12-15	2.7	3.5	59	5.92	80		
26	R1	0.18	15+	3.1	1.1	78	9.76	174		
26	R1	0.15	15+	2.8	1.5	60	8.03	110		
Avg.		0.15		2.8	2.2	62	6.86	102	47	

Flashes the entire length of sample
Flashes; continues to glow after flame out
Flashes
Flashes

TABLE IV (Continued)
TEST METHOD MBS - DIANT PANEL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate Initial 3" Length (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Factor (F₂)</u>	<u>Flame Spread Index (I₂)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
27	R2	0.15	15+	3.1	3.6	82	10.13	189		
27	0.11	15+	3.1	3.9	83	11.28	214			
27	0.18	15+	2.9	3.3	107	10.38	253			
27	0.16	15+	3.2	1.2	90	13.05	268			
<u>Avg.</u>	<u>0.15</u>		<u>3.1</u>	<u>3.0</u>	<u>91</u>	<u>11.21</u>	<u>231</u>	<u>14</u>		
28	F2	0.14	0-3	0.7	9	1.00	2.1			
28	0.13	0-3	0.7	8	1.00	1.8				
28	0.06	3-6	13.6	0.8	16	4.57	17			
28	0.05	0-3	0.7	0.7	22	1.00	5.0			
<u>Avg.</u>	<u>0.09</u>		<u>3.4</u>	<u>0.7</u>	<u>14</u>	<u>1.89</u>	<u>6.4</u>	<u>95</u>		
29	L1	0.11	3-9	15.8	3.7	35	4.33	35		
29	0.09	9-12	9.7	2.8	28	7.00	45			
29	0.12	9-12	15.0	2.8	46	7.54	79			
29	0.12	0-3	0.7	3.1	50	1.00	11			
<u>Avg.</u>	<u>0.11</u>		<u>10.1</u>	<u>3.1</u>	<u>40</u>	<u>4.97</u>	<u>62</u>	<u>57</u>		
30	S3	0.25	9-12	3.8	25.4	63	5.22	75		
30	0.21	9-12	4.7	25.1	55	3.24	41			
30	0.12	9-12	4.8	24.2	71	5.41	88			
30	0.25	9-12	7.3	24.6	42	6.79	65			
<u>Avg.</u>	<u>0.21</u>		<u>5.1</u>	<u>24.8</u>	<u>58</u>	<u>5.17</u>	<u>67</u>	<u>26</u>		
31	S3	0.22	9-12	2.9	19.2	38	2.63	23		
31	0.11	9-12	4.6	16.8	43	6.29	61			
31	0.09	9-12	2.9	16.6	59	2.89	39			
31	0.22	9-12	2.3	18.1	53	2.96	36			
<u>Avg.</u>	<u>0.16</u>		<u>3.2</u>	<u>17.7</u>	<u>48</u>	<u>3.69</u>	<u>40</u>	<u>35</u>		
32	S3	0.17	9-12	3.8	21.0	73	6.17	103		
32	0.15	9-12	5.8	19.2	62	5.15	73			
32	0.24	9-12	5.4	1.3	68	4.62	72			
32	0.29	12-15	5.1	17.4	77	5.57	98			
<u>Avg.</u>	<u>0.22</u>		<u>5.5</u>	<u>14.7</u>	<u>70</u>	<u>5.38</u>	<u>86</u>	<u>16</u>		

TABLE IV (Continued)
TEST METHOD FOR RADIANT PANEL

Part 1 - General Tests - Representative Materials

Material No. Code	Ignition Time (min.)	Burn Length (in.)	Burn Rate (Initial 3" Length) (in./min.)	Smoke Factor (\bar{m}_S)	Heat Factor (deg. C.)	Plane Spread Factor (F_p)	Plane Spread Index (I_p)	Coefficient of Variation (percent)	Remarks
33 S3	0.15	9-12	7.0	17.4	55	6.1 ^a	78		
33	0.22	9-12	7.1	15.0	53	6.45	76		
33	0.24	9-12	7.5	10.8	60	6.20	85		
33	0.18	9-12	7.0	9.1	81	7.83	145		
Avg.	0.20		7.2	13.1	62	6.62	96	17	
									Flashes
34 S3	0.18	9-12	3.9	6.5	18	7.79	32		
34	0.09	6-9	4.5	7.1	20	4.52	21		
34	0.08	9-12	3.8	6.8	26	4.78	28		
34	0.22	9-12	6.0	6.3	34	5.76	45		
Avg.	0.14		4.6	6.7	25	5.71	31	28	
									Flashes
35 S2	0.10	6-9	4.6	1.7	16	10.02	37		
35	0.11	6-9	6.1	3.0	18	6.23	27		
35	0.16	6-9	7.0	1.8	9	4.28	8.8		
35	0.19	3-6	3.1	2.1	14	1.87	6.0		
Avg.	0.14		5.2	2.2	16	5.60	19	65	
36 F2	0.10	12-15	17.6	4.1	28	17.60	112		
36	0.10	12-15	20.0	5.8	31	12.29	87		
Avg.	0.10		18.8	4.9	29	16.95	100	13	
37 F2	0.09	15+	33.4	5.9	63	40.35	580		
37	0.05	15+	25.0	5.6	62	43.77	619		
Avg.	0.07		29.2	5.9	63	42.06	599	3	
38 F2	0.09	15+	33.4	4.7	46	44.59	468		
38	0.06	15+	25.0	5.6	50	44.17	504		
Avg.	0.08		29.2	5.2	48	44.38	486	4	
39 L2	0.16	9-12	4.8	2.9	26	7.44	44		
39	0.15	9-12	6.7	4.7	27	7.78	48		
39	0.14	9-12	5.5	2.3	26	10.57	58		
39	0.17	9-12	6.7	1.9	23	9.16	48		
Avg.	0.16		5.9	2.9	25	8.74	50	10	

TABLE IV (Continued)
TEST METHOD MBS RADIANT PANEL

Part I- General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_s)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
40	F2	0.05	15+	30.0	1.3	84	47.39	908		
40		0.05	15+	37.5	1.8	75	45.72	782		
40		0.10	15+	60.0	1.2	39	67.61	601		
40		0.10	15+	50.0	1.4	62	59.22	837		
<u>Avg.</u>		<u>0.08</u>		<u>44.4</u>	<u>1.4</u>	<u>.65</u>	<u>54.99</u>	<u>782</u>	<u>15</u>	
41	R1	0.30	12-15	4.1	7.2	141	6.93	223		
41		0.70	12-15	5.3	7.8	152	7.96	276		
41		0.75	9-12	6.7	7.4	134	6.78	207		
41		0.30	9-12	2.7	7.6	123	3.58	100		
<u>Avg.</u>		<u>0.51</u>		<u>4.7</u>	<u>7.5</u>	<u>137</u>	<u>6.31</u>	<u>202</u>	<u>32</u>	
42	P1	0.18	15+	9.1	2.1	78	11.11	198		
42		0.21	15+	8.8	2.2	61	11.21	156		
42		0.15	15+	9.7	1.8	67	11.39	174		
42		0.18	15+	9.4	1.1	65	11.11	165		
<u>Avg.</u>		<u>0.18</u>		<u>9.2</u>	<u>1.8</u>	<u>68</u>	<u>11.21</u>	<u>173</u>	<u>9</u>	
43	P1	0.14	15+	37.5	0.7	79	42.52	766		
43		0.11	15+	27.3	0.3	74	39.91	673		
43		0.16	15+	50.0	0.6	63	35.26	507		
43		0.15	15+	20.0	0.4	67	5.11	445		
<u>Avg.</u>		<u>0.14</u>		<u>33.7</u>	<u>0.5</u>	<u>71</u>	<u>36.70</u>	<u>598</u>	<u>22</u>	
44	P1	0.14	15+	11.1	1.5	66	17.79	268		
44		0.20	15+	12.0	2.0	59	12.34	167		
44		0.11	15+	10.4	2.0	58	13.58	180		
44		0.17	15+	11.1	1.5	66	14.54	219		
<u>Avg.</u>		<u>0.16</u>		<u>11.1</u>	<u>1.7</u>	<u>62</u>	<u>14.58</u>	<u>208</u>	<u>19</u>	
45	P1	0.11	15+	16.7	0.9	79	14.50	261		
45		0.50	15+	37.5	0.6	71	13.30	223		
45		0.16	15+	14.3	0.7	59	13.12	177		
45		0.12	15+	11.1	0.8	88	13.56	212		
<u>Avg.</u>		<u>0.13</u>		<u>19.9</u>	<u>0.8</u>	<u>74</u>	<u>13.75</u>	<u>233</u>	<u>16</u>	

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part I - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mB)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (F_s)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
46	F2	0.18	12-15	6.1	3.3	27	7.96	4.9		
46		0.17	12-15	5.7	2.9	24	8.83	4.8		
46		0.07	12-15	2.7	3.1	4.5	6.63	89		
46		0.07	12-15	3.3	3.3	3.9	10.78	96		
<u>Avg.</u>		0.17		4.4	3.2	34	9.05	70	31	
47	S1	0.09	9-12	33.3	0.4	15	32.3	111		
47		0.08	12-15	37.5	1.6	17	33.7	131		
47		0.05	15+	27.3	1.3	37	42.0	354		
47		0.06	12-15	30.0	0.9	39	34.2	303		
<u>Avg.</u>		0.07		32.0	1.1	27	35.5	225	47	
48	F2	0.11	9-12	2.8	1.2	30	7.58	52		
48		0.09	6-9	2.6	1.5	16	6.14	22		
48		0.07	9-12	2.5	0.9	36	7.11	58		
48		0.07	9-12	2.7	1.3	36	6.60	56		
<u>Avg.</u>		0.09		2.6	1.2	30	6.91	47	31	
49	F2	0.12	12-15	3.8	2.8	49	1.33	166		
49		0.15	15+	33.3	2.3	45	19.54	198		
49		0.12	9-12	23.1	2.1	45	11.15	114		
49		0.13	9-12	23.0	2.5	45	8.25	137		
<u>Avg.</u>		0.13		21.3	2.4	41	13.39	154	20	
50	F2	0.11	12-15	27.3	1.8	59	30.07	405		
50		0.09	12-15	23.1	2.1	46	20.19	212		
50		0.15	12-15	21.4	1.7	50	31.29	357		
50		0.06	9-12	15.0	1.5	62	22.57	376		
<u>Avg.</u>		0.10		21.7	1.8	52	26.03	337	22	
51	F2	0.05	0-3		1.0	18	1.00	4.1		
51		0.05	0-3		2.7	13	1.00	2.9		
51		0.05	6-9	6.8	0.7	22	36.37	182		
51		0.04	6-9	7.5	0.9	21	10.94	52		
<u>Avg.</u>		0.05		7.2	1.3	19	12.33	61	121	

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_S)</u>	<u>Flame Spread Index (I_F)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
52 F2 0.05 6-9 5.4 1.3 23 11.64 61 Flashes to 12 inches									
52 F2 0.05 3-6 5.5 0.2 18 2.66 11 Flashes									
52 F2 0.08 3-6 4.6 0.7 20 2.36 11 Flashes									
52 F2 0.06 6-9 6.0 0.9 29 8.11 54 Flashes to 12 inches									
<u>Avg.</u>	<u>0.06</u>	<u>5.4</u>	<u>0.8</u>	<u>22</u>	<u>6.19</u>	<u>34</u>	<u>68</u>		
53 F2 0.07 6-9 3.6 1.1 23 5.44 29 Flashes									
53 F2 0.07 0-3 4.1 1.0 25 1.00 5.7 Flashes									
53 F2 0.08 6-9 4.1 0.5 18 8.89 34 Flashes									
53 F2 0.06 6-9 4.9 0.8 36 8.79 72 Flashes									
<u>Avg.</u>	<u>0.07</u>	<u>3.2</u>	<u>0.8</u>	<u>26</u>	<u>6.03</u>	<u>36</u>	<u>67</u>		
54 F2 0.09 6-9 3.7 2.2 34 6.65 52 Flashes									
54 F2 0.09 6-9 3.6 2.4 28 7.95 51 Flashes									
54 F2 0.09 6-9 4.1 1.5 28 10.54 67 Flashes									
54 F2 0.09 6-9 3.8 1.9 42 4.99 48 Flashes									
<u>Avg.</u>	<u>0.09</u>	<u>3.8</u>	<u>2.0</u>	<u>33</u>	<u>7.53</u>	<u>54</u>	<u>64</u>		
55 F2 0.15 12-15 2.8 5.9 71 30.38 492 Flashes at first of test									
55 F2 0.08 12-15 2.8 5.8 60 21.99 301 Flashes at first of test									
55 F2 0.11 12-15 5.5 4.5 54 8.55 106 Flashes at first of test									
55 F2 0.14 12-15 3.1 5.1 76 24.31 421 Flashes at first of test									
<u>Avg.</u>	<u>0.12</u>	<u>3.6</u>	<u>5.3</u>	<u>65</u>	<u>21.32</u>	<u>330</u>	<u>44</u>		
56 F2 0.05 9-12 60.0 0.9 15 47.45 162 Flashes									
56 F2 0.05 9-12 75.0 1.3 12 70.44 193 Flashes									
56 F2 0.05 9-12 100.0 0.3 13 55.16 164 Flashes									
56 F2 0.04 9-12 60.0 0.9 22 70.44 353 Flashes									
<u>Avg.</u>	<u>0.05</u>	<u>73.6</u>	<u>0.8</u>	<u>16</u>	<u>60.87</u>	<u>218</u>	<u>36</u>		
57 L1 0.05 12-15 60.0 2.1 13 42.11 125 Flashes									
57 L1 0.05 9-12 42.3 1.6 8 75.55 138 Flashes									
57 L1 0.05 6-9 75.0 0.8 7 45.77 73 Flashes									
57 L1 0.04 9-12 50.0 1.3 23 60.99 389 Flashes									
<u>Avg.</u>	<u>0.05</u>	<u>56.8</u>	<u>1.4</u>	<u>14</u>	<u>56.03</u>	<u>181</u>	<u>68</u>		

TABLE IV (Continued)

TEST METHOD NPS RADIANT PANEL

Part 1 - General Tests - Representative Materials

<u>Material No.</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg.)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_s)</u>	<u>Coefficient of Vibration (percent)</u>	<u>Remarks</u>
58 12	0.10	6-9	9.1	1.9	12	6.24	17		
58	0.12	6-9	6.3	2.4	20	10.38	47		
58	0.17	6-9	7.9	1.2	20	5.08	23		
58	0.10	6-9	6.6	1.8	20	4.96	23		
Avg.	0.12		5.7	1.8	18	6.67	28	42	
59 12	0.09	6-9	6.5	1.4	19	6.65	29		
59	0.09	6-9	6.6	2.1	17	5.65	22		
59	0.17	6-9	6.0	3.0	15	4.34	15		
59	0.10	6-9	6.5	2.1	8	4.19	7.6		
Avg.	0.11		6.4	2.2	15	5.21	18	44	
60 F2	0.07	0-3							
60	0.09	12-15	30.00	1.5	39	1.00	8.9		
60	0.09	3-6	11.1	3.1	29	16.27	108		
60	0.07	0-3							
Avg.	0.08		10.3	2.1	32	5.51	36	115	
61 F2	0-2								
61	0-3								
61	0-3								
61	0-3								
Avg.									
62 F2	0-2								
62	0-3								
62	0-3								
62	0-3								
Avg.									
63 F2	0-3								
63	0-3								
63	0-3								
63	0-3								
Avg.									

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part I - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>H-at Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_s)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
64	F2	0.04	9-12	60.0	1.7	19	70.44	305		
64		0.03	12-15	50.0	2.3	11	116.11	291		
64		0.04	12-15	37.5	1.4	28	85.08	54.3		
64		0.02	12-15	100.0	1.9	7	84.33	135		
<u>Avg.</u>		<u>0.04</u>	<u>61.9</u>	<u>61.9</u>	<u>1.8</u>	<u>16</u>	<u>88.99</u>	<u>319</u>	<u>46</u>	
65	F2	0.11	0-3		1.5	50	1.00	11		Burns only at pilot
65		0.12	0-3		1.5	45	1.00	10		
65		0.09	0-3		1.5	47	1.00	11		
65		0.13	0-3		1.5	38	1.00	8.7		
<u>Avg.</u>		<u>0.10</u>	<u>0.05</u>		<u>1.5</u>	<u>45</u>	<u>1.00</u>	<u>10</u>	<u>10</u>	
66	S1	0.06	6-9	21.4	1.6	22	10.54	53		
66		0.06	6-9	13.7	1.4	17	8.16	32		
36		0.04	3-6	12.5	1.3	13	4.57	14		
<u>Avg.</u>		<u>0.05</u>	<u>3-6</u>	<u>15.9</u>	<u>1.4</u>	<u>17</u>	<u>7.76</u>	<u>33</u>		
67	F3	0.16	15+	10.7	0.7	74	11.21	189		
67		0.20	15+	8.6	0.2	56	12.15	155		
67		0.12	15+	3.4	0.3	58	33.67	445		
<u>Avg.</u>		<u>0.16</u>	<u>15+</u>	<u>7.6</u>	<u>0.4</u>	<u>63</u>	<u>19.01</u>	<u>263</u>	<u>41</u>	
68	S1	0.04	15+	30.0	0.1	34	33.22	258		
68		0.06	15+	33.3	0.6	33	44.00	331		
68		0.05	15+	23.1	0.4	28	68.16	435		
68		0.05	15+	21.4	0.6	33	55.71	419		
<u>Avg.</u>		<u>0.05</u>	<u>15+</u>	<u>26.9</u>	<u>0.4</u>	<u>32</u>	<u>50.27</u>	<u>361</u>	<u>20</u>	
69	S2	0.20	0-3		4.5	35	1.00	7.9		Rapid smouldering, no large flame
69		0.26	0-3		5.3	23	1.00	5.2		
69		0.41	0-3		4.7	29	1.00	6.6		
69		0.21	0-3		5.5	20	1.00	4.6		
<u>Avg.</u>		<u>0.27</u>	<u>0-3</u>		<u>5.0</u>	<u>27</u>	<u>1.00</u>	<u>6.1</u>	<u>20</u>	
										Burns at pilot, large amounts of white smoke

TABLE IV (Continued)
TEST METHOD NES RADIANT PANEL

Part I - General Tests - Representative Materials

Material No.	Code	Ignition Time (min.)	Burn Length (in.)	Burn Rate (Initial 3-in. Length) (in./min.)	Smoke Factor (cm ³)	Heat Factor (deg. C.)	Flame Spread Factor (F _a)	Flame Spread Index (F _a)	Coefficient of Variation (percent)	Remarks
70	Z1	0.09	6-9	9.1	12	20.04	55			
70		0.10	3-6	6.5	20	2.78	13			
70		0.09	3-6	7.3	21	3.00	14			
70		0.08	6-9	9.1	7	8.44	14			
Avg.		0.09		8.0	15	8.57	24	7.3		
71	A	0.07	0-3							
71		0.05	0-3							
71		0.08	0-3							
Avg.		0.07			0.6	45	1.00	10		
72	A	0.05	9-12	2.6	0.8	31	1.00	7.1		
72		0.05	0-3		0.8	28	1.00	6.4		
Avg.		0.05		1.3	0.9	33	1.00	10		
72	A	0.05	12-15	6.0	2.1	35	1.00	7.9	19	
73	A	0.05	12-15	12.0	7.8	51	26.25	305		
73		0.07	15+							
73		0.05	9-12	6.9	5.3	66	16.94	255		
73		0.06	15+	6.4	3.4	21	19.74	96		
Avg.		0.05		7.8	4.6	31	15.40	109		
73	A	0.31	12-15	8.3	2.7	51	26.25	305		
74	A	0.15	9-12	5.7	2.7	15	7.80	27		
Avg.		0.23		7.0	2.7	22	6.89	33	18	
75	A	6-9			0.7	11	5.05	13		
75		9-12			2.8	10	16.60	38		
Avg.					1.8	11	10.83	25	49	
76	A	0.20	9-12	3.6	32.4	67	3.85	59		
76		0.17	12-15	3.1	38.6	64	4.27	62		
76		0.14	12-15	3.8	34.2	71	4.37	71		
76		0.14	12-15	3.9	33.1	69	5.03	69		
Avg.		0.16		3.6	34.6	68	4.38	68	31	

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part I - General Tests - Representative Materials

<u>Material No.</u>	<u>Code</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_s)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
77	S3	0.19	15+	3.8	3.3	198	8.39	379		
77	0.20	15+	4.0	4.0	190	8.01	347			
Avg.		0.20		3.9	3.7	194	8.20	363	14	Melts, drops fall to floor and cause large fire on floor
78	A	0.57	15+	6.8	16.7	94	6.55	140		
78		0.37	15+	17.6	18.2	89	15.38	312		
78	0.21	15+	4.2	17.1	96	7.16	157			
Avg.		0.38		9.5	17.3	93	9.70	203	38	
79	A	12-15		6.4	42	4.49	43			Continues to glow for approx. 30 mins. after test
79		12-15		4.2	29	4.67	31			
79		9-12		7.1	49	3.57	40			
79		12-15		6.7	47	4.72	51			
Avg.				6.1	42	4.36	41		17	
80	A	0.30	6-9	4.7	7.2	49	4.62	52		
80		0.33	9-12	5.0	3.8	59	9.37	126		
80		0.36	6-9	4.5	3.3	69	4.24	67		
80		0.40	9-12	6.5	2.4	58	6.01	80		
Avg.		0.35		5.2	4.2	59	6.06	81	34	
81	A	0.35	9-12	3.7	6.0	54	5.32	66		
81		0.51	9-12	4.4	3.0	56	5.17	66		
81		0.58	9-12	5.2	2.8	70	5.60	89		
81		0.37	9-12	4.4	3.1	73	4.99	83		
Avg.		0.45		4.4	3.7	63	5.27	76	14	
82	A	0.18	9-12	1.6	4.7	55	4.21	53		
82		0.15	6-9	2.2	7.5	54	2.95	36		
82		0.14	6-9	2.0	3.9	55	5.62	79		
82		0.14	9-12	2.9	5.3	63	3.70	53		
Avg.		0.15		2.2	5.4	59	4.12	55	19	Large flame at top of specimen

TABLE IV (Continued)
TEST METHOD WES RADIANT PANEL

Part I - General Tests - Representative Materials							Remarks		
Material No.	Code	Ignition Time (min.)	Burn Length (in.)	Burn Rate (Initial 3' Length) (in./min.)	Smoke Factor (in.8)	Heat Factor (deg. C.)	Flame Spread Factor (F _s)	Flame Spread Index (I _s)	Coefficient of Variation (percent)
82	X	0.08	6-9	2.3	38	10.81	94	Grasscloth cover only	
82		0.33	9-12	10.4	22	7.46	37	Polyester Glass fabric only	
82		0.08	15+	16.6	44	31.97	321	1-inch Paper Honeycomb only	
82		0.14	6-9	2.8	41	12.93	121	Grasscloth & Polyester glass fabric	
Outer covering blisters and burns before other material, slight flashing									
83	A	0.15	9-12	1.0	4.6	41	3.04	28	
83		0.20	9-12	1.0	6.4	40	3.53	32	
83		0.09	9-12	1.0	5.7	58	4.16	55	
83		0.12	9-12	1.0	4.1	43	3.31	33	
AVG.		0.14		1.0	5.2	46	3.51	37	17
84	A	0.12	9-12	13.1	5.3	30	5.45	37	
84		0.14	9-12	3.6	4.9	53	4.72	57	
84		0.08	9-12	3.4	4.2	46	4.93	52	
84		0.17	9-12	4.0	2.3	37	11.16	94	
AVG.		0.13		5.9	4.2	42	6.57	60	35
84	X	0.08	9-12	8.6	10	12.25	28	Cover material only	
84		0.08	15+	27.3	49	32.37	362	½-inch Paper Honeycomb only	
Plashes									
85	13	0.57	6-9	15.0	1.1	14	9.03	29	
85		0.51	6-9	11.1	0.8	12	4.72	13	
85		0.53	6-9	20.0	2.9	7	4.86	7.8	
85		0.45	6-9	9.4	0.9	17	4.85	19	
AVG.		0.52		13.9	1.2	13	5.87	17	46
86	13	0.41	9-12	6.3	0.7	12	4.96	14	
86		0.37	9-12	4.9	1.3	10	5.72	13	
86		0.53	9-12	8.3	1.6	16	6.43	26	
86		0.43	6-9	8.8	0.9	16	3.78	14	
AVG.		0.46		7.1	1.1	14	5.22	16	27

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part I - General Tests - Representative Materials

<u>Material No.</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (mg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_s)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
87 L3	0.60	6-9	12.5	1.5	17	5.13	20		
87	0.49	9-12	12.5	1.3	13	6.72	20		
87	0.42	6-9	15.8	0.5	7	4.13	6.6		
87	0.35	6-9	8.8	0.8	17	4.02	16		
<u>Avg.</u>	<u>0.47</u>	<u>12.4</u>	<u>1.0</u>	<u>14</u>	<u>5.00</u>	<u>16</u>	<u>34</u>	<u>9</u>	
88 L3	0-3		0.2	16	1.00				No flame; Mylar melts and pulls away from aluminum
88	0-3		0.1	17	1.00				
88	0-3		0.1	13	1.00				
88	0-3		0.1	14	1.00				
<u>Avg.</u>			<u>0.1</u>	<u>15</u>	<u>1.00</u>	<u>3.4</u>	<u>9</u>		
89 P3	0.18	15+	12.0	1.2	40	12.06	110		
89	0.16	15+	10.7	0.7	66	10.60	160		
89	0.11	15+	8.1	0.7	36	11.94	98		
89	0.15	15+	11.5	0.8	57	18.59	242		
<u>Avg.</u>	<u>0.15</u>	<u>10.6</u>	<u>0.9</u>	<u>50</u>	<u>13.30</u>	<u>152</u>	<u>37</u>		
90 S1	0.03	15+	9.1	21.3	136	48.38	1500		
91 S1	0.02	15+	23.1		209	62.04	2956		
95 S1	0.12	9-12	11.5	0.4	15	8.79	30		
96 S1	0.05	6-9	5.3		24	8.16	65		
96	0.05	9-12	4.0		25	63.36	361		
96	0.05	9-12	5.7		25	17.36	99		
96	0.05	9-12	5.3		22	6.77	34		
<u>Avg.</u>	<u>0.05</u>	<u>5.0</u>			<u>24</u>	<u>23.91</u>	<u>135</u>	<u>99</u>	

TABLE IV (Continued)

TEST METHOD NBS RADIANT PANEL

Part I - General Tests - Representative Materials

<u>Material</u> <u>No.</u>	<u>Code</u>	<u>Ignition Time (sec.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (wg)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_a)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
97	S1	0.05	9-12	13.1		21	42.24	202		
97		0.05	6-9	12.0		23	8.49	45		
97		0.05	6-9	12.5		17	12.77	50		
97		0.05	6-9	10.0		27	9.11	56		
Avg.		0.05		11.9		22	18.15	88	75	
98	S1	0.05	6-9	11.1		32	20.78	152		
98		0.06	9-12	8.1		25	22.76	130		
98		0.05	6-9	7.7		25	8.53	49		
98		0.05	9-12	11.6		39	12.27	109		
Avg.		0.05		9.6		30	16.09	110	35	
106	S1	1.5+								
106	X	0.	15+							
106	X	0.10	15+							
107	S1	0.09	0-3							
108	S1	C.11	0-3							
109	S1	0.07	9-12	15.8	3.3	22	9.12	46		

X Experimental

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part 2 - Special Tests - New, Used and Cleaned Materials

Material No.	Ignition Time (min.)	Burn Length (in.)	Burn Rate (Initial 3" Length) (in./min.)	Smoke Factor (mg)	Heat Factor (deg. C.)	Flame Spread Factor (F _s)	Flame Spread Index (I _a)	Coefficient of Variation (Percent)	Remarks
13N P1	0.15	15+	11.5	0.8	92	14.13	296		
13HC	0.15	15+	17.6	0.7	103	14.48	340		
13U	0.19	15+	16.6	0.7	116	21.86	578		
13V	0.18	15+	16.6	0.4	121	19.80	546		
Avg.	0.19		16.6	0.5	118	20.83	562	3	
13UC P1	0.17	15+	14.3	0.8	130	21.16	627		
13UC	0.17	15+	15.0	0.4	116	21.11	558		
Avg.	0.17		14.6	0.6	123	21.16	592	5	
18N F1	0.23	15+	25.0		51	17.84	207		Melts; the drops fall to floor & burn
18HC	0.20	15+	17.6	0.4	42	14.64	140		Melts; the drops fall to floor & burn
18HC	0.26	15+	15.8	0.3	59	14.47	197		Melts; the drops fall to floor & burn
Avg.	0.22		16.7	0.4	50	14.55	167	17	
18U P1	0.17	15+	20.0	0.7	47	14.74	158		Melts; the drops fall to floor & burn
18U	0.18	15+	17.6	0.8	45	17.06	175		
Avg.	0.18		18.8	0.8	46	15.90	166	5	
18UC F1	0.15	15+	21.4	1.4	60	14.94	204		Melts; the drops fall to floor & burn
18UC	0.15	15+	14.3	0.9	43	14.64	144		
Avg.	0.15		17.9	1.2	51	14.79	174	17	
19W P1	9-12				16	10.46	38		Melts; the drops fall to floor & burn
19NC	12-15				19	9.49	40		Melts; the drops fall to floor & burn
19U	0-3				12	1.00	2.7		Melts; the drops fall to floor, no burning on floor
19U	0-3				12	1.00	2.7		
Avg.					12	1.00	2.7		
19UC P1	0-3				11	1.00	2.5		Melts; the drops fall to floor
19UC	0-3				14	1.00	3.2		
Avg.					12	1.00	2.8	16	

TABLE IV (Continued)
TEST METHOD NBS RADIANT PANEL

Part 2 - Special Tests - New, Used and Cleaned Materials

<u>Material No.</u>	<u>Ignition Time (min.)</u>	<u>Burn Length (in.)</u>	<u>Burn Rate (Initial 3" Length) (in./min.)</u>	<u>Smoke Factor (in.)</u>	<u>Heat Factor (deg. C.)</u>	<u>Flame Spread Factor (F_s)</u>	<u>Flame Spread Index (I_v)</u>	<u>Coefficient of Variation (percent)</u>	<u>Remarks</u>
20N P1		0-3			19	1.00	4.3		
20NC		9-12			19	0.39	36		Melts; the drops fall to floor & burn
20UC		0-3			16	1.00	3.2		Melts; no burning on floor
Avg.	0.23				16	4.69	20	.02	
20U P1	0.23	0-3		0.3	11	1.00	2.5		Some burning at pilot
20U	0.22	0-3		0.2	16	1.00	3.6		
Avg.	0.23			0.3	13	1.00	3.0	.18	
20UC P1		0-3			15	1.00	3.4		Some burning at pilot
20UC		0-3			10	1.00	2.3		
Avg.	0.10				13	1.00	2.9	.19	
27N R2	0.11	15+	3.1	2.9	83	11.28	214		
27NC	0.10	9-12	2.1	2.3	107	4.08	100		
27UC	0.10	9-12	2.1	2.2	101	4.20	97		
Avg.	0.10		2.1	2.3	104	4.14	98	2	
27U R2	0.	15+	2.5	2.5	132	9.87	297		
27U	0.	15+	2.8	2.7	115	8.84	232		
Avg.	0.13		2.9	2.6	123	9.35	264	1	
27UC R2	0.11	12-15	2.8	2.7	124	12.35	349		
27UC	0.12	12-15	2.9	2.4	133	7.86	220		
Avg.	0.12		2.9	2.5	124	10.11	285	.23	
70 P1	0-3			0.2	25	1.00	5.7		Cleaned with Parchiorethylene spot
70	6-9			0.3	29	22.85	151		cleaner and then placed in con-
Avg.				0.3	27	11.92	78		ditioning room overnight to dry

TABLE IV (Continued)
TEST METHOD EHS RADIANT PANEL

Part 2 - Special Tests - New, Used and Cleaned Materials

Material No.	Code	Ignition Time (min.)	Burn Length (in.)	Burn Rate (Initial 3-in. Length) (in./min.)	Smoke Factor (mg)	Heat Factor (deg. C.)	Flame Spread Factor (F _s)	Flame Spread Index (I _s)	Coefficient of Variation (percent)	Remarks
99N	R2	0.10	12-15	3.0	3.1	110	12.38	311		
99N	R2	0.10	12-15	3.0	3.2	96	8.74	187		
Avg.		0.10		3.0	3.2	102	10.56	249	25	
99NC	R2	0.10	15+	3.1	2.3	86	10.56	207		
99NC	R2	0.17	15	3.4	2.1	81	13.78	255		
Avg.		0.13		3.3	2.2	84	12.17	231	10	
99U	R2	0.09	12-15	2.2	1.3	97	10.54	233		
99U	R2	0.09	12-15	2.9	0.9	87	11.84	235		
Avg.		0.09		2.5	1.1	92	11.19	236	1	
99UC	R2	0.11	9-12	3.0	1.8	98	4.23	95		
99UC	R2	0.12	15+	3.0	2.1	104	9.54	226		
Avg.		0.12		3.0	1.9	101	6.89	160	41	
100N	R1	0.12	3-6	2.8	1.4	44	1.83	18		
100N	R1	0.13	6-9	2.8	1.3	34	3.08	24		
Avg.		0.13		2.8	1.4	39	2.45	21	14	
100RC	R1	0.12	6-9	7.9	1.2	29	3.45	23		
100NC	R1	0.12	6-9	2.5	1.2	39	1.99	18		
Avg.		0.12		5.2	1.2	34	2.72	20	13	
100U	R1	0.14	6-9	12.5	1.2	36	4.03	33		
100U	R1	0.14	6-9	3.8	1.1	54	3.00	37		
Avg.		0.14		8.2	1.2	45	3.51	35	1	
100UC	R1	0.12	6-9	16.7	1.4	59	4.82	65		
100UC	R1	0.12	6-9	16.7	1.3	55	4.85	61		
Avg.		0.12		16.7	1.4	57	4.84	63	3	

Note: Letters after material no. signify: N - New; NC - New and Cleaned; U - Used; UC - Used and Cleaned.